Argonne National Laboratory

Ten-Year Site Plan

FY 2007–FY 2016

May 2005

ANL/PFS/TYSP-2005

Office of Science
U.S. Department of Energy

The University of Chicago
Argonne National Laboratory

Argonne is operated by The University of Chicago for the U.S. Department of Energy Office of Science

About Argonne National Laboratory

Argonne is operated by The University of Chicago for the U.S. Department of Energy Office of Science, under contract W-31-109-Eng-38. The Laboratory's main facility is outside Chicago, at 9700 South Cass Avenue, Argonne, Illinois 60439. For information about Argonne and its pioneering science and technology programs, see www.anl.gov.

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Preface

This document has been prepared in compliance with the requirements of DOE Order 430.1B, Real Property Asset Management. It presents the Laboratory's *Ten-Year Site Plan* for Argonne's physical facilities. To facilitate comparison with the DOE guidance, Table PREF.1 correlates this document's contents with the specific guidance received from the Office of Science.

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Executive Summary

The Argonne National Laboratory *Ten-Year Site Plan* documents the Laboratory's vision for its 21st century scientific missions and for the supporting infrastructure. This plan identifies the existing condition of Argonne's infrastructure; establishes the required facilities baseline for the scientific missions of the 21st century; provides a comprehensive plan for the sustainment, recapitalization, and modernization of the existing facilities; and details the resources required to achieve the visions of Argonne and the DOE Office of Science (DOE-SC). The plan also identifies the major new programmatic facilities individually planned for integration into the existing site infrastructure.

The Argonne site has few constraints to expanding the Laboratory's role in 21st century research. Argonne's physical setting is unencumbered by serious environmental or contamination legacies, and sufficient land is readily available to support mission adaptation and developmental change. Rather, the challenges for Argonne are to rehabilitate and reshape the existing facility infrastructure to meet the needs of emerging scientific missions, communications, and security technologies and to maintain the infrastructure in a readied condition. Requirements for upgrading the infrastructure include compliance with today's standards of environmental performance and safety, addressing increased national security concerns, protecting physical assets, and removing obsolete special-purpose facilities.

To achieve its vision for the 21st century, Argonne requires an investment of approximately $662 million for sustainment, recapitalization, and modernization in FY 2007 through FY 2016. Of this needed investment, $304 million will be funded internally, in keeping with Argonne's continued commitment to meet the current DOE-SC Maintenance Investment Index goal of 2%. This amount includes an additional commitment of $20 million in Institutional General Plant Projects funds. Another $358 million in direct funding is expected from the Science Laboratories Infrastructure and General Plant Projects programs. Funding from other sources, such as third-party financing for the construction of new facilities and energy-related infrastructure improvement and funding already committed by the DOE Office of Environmental Management for decontamination and demolition activities, is not included in the funding needs. The funding commitments underlying this plan will enable Argonne to reduce operating costs, improve scientific productivity, and realize a state-of-the-art infrastructure that is reliable, efficient, safe, secure, and environmentally sound by FY 2016.

In the absence of the needed level of funding commitment, improvement in overall infrastructure condition is unlikely. In this case, the Laboratory's ability to perform world-class, cost-effective research could begin to deteriorate over the planning period, resulting in inability to attract top scientific talent and the loss of key personnel to better-equipped employers. An issue related to decontamination and decommissioning of active nuclear facilities may emerge in the future if Argonne cannot secure adequate funding for effective use of the many nuclear facilities that it maintains and operates, including equipment and experimental capabilities that are unique across the DOE complex.

1 Site Summary

Argonne had its inception in the World War II research activity under the leadership of Enrico Fermi at the University of Chicago code named the "Metallurgical Laboratory." After the war, the U.S. government continued nuclear research, development, and production activities. The Argonne Division of the Metallurgical Laboratory became Argonne National Laboratory on July 1, 1946. The Atomic Energy Act of 1946 established a civilian agency, the Atomic Energy Commission, to manage and control the atomic energy program. The Commission assumed control of the program and broadly defined basic research as a major element of the Argonne mission, a principle that carried over to other multiprogram national laboratories as they evolved or were created. At its inception, the Argonne site was located at the suburban fringe in a rural setting removed from the center of population, yet still accessible to the research staff and faculty of the University of Chicago. The intervening 60 years of growth in the metropolitan Chicago region have fundamentally altered Argonne's setting, though the Waterfall Glen Forest Preserve surrounding the Laboratory somewhat obscures the extent of this change.

1.1 Physical Description

Argonne conducts basic and technology-directed research on a 1,500-acre site owned by DOE in DuPage County, Illinois, about 25 miles southwest of Chicago (Figure 1.1). The site is surrounded by Waterfall Glen Forest Preserve, a 2,470-acre greenbelt.

Today the Argonne site is ideally situated for its purpose as a 21st century multiprogram research laboratory. Its ready access to businesses, industries, and universities and its location on one of DuPage County's growth corridors ensures that the Laboratory will maintain its competitive position in attracting and retaining highly skilled and educated personnel and in fostering business links to other high-technology enterprises in the area.

Activities at Argonne support the full range of missions described in Chapter 2. Major facilities at the site include the Advanced Photon Source (APS), the Laboratory's newest and largest user facility; the Intense Pulsed Neutron Source (IPNS); the Argonne Tandem-Linac Accelerator System (ATLAS); and the Electron Microscopy Center. Researchers from outside Argonne use all these facilities heavily. Argonne also houses a full spectrum of administrative and technical support organizations, as well as DOE's Chicago Operations Office and the New Brunswick Laboratory, both of which use facilities operated and maintained by Argonne.

The site currently accommodates approximately 4,800 persons (including DOE employees, contractors, and guests). Throughout the year, over 2,000 other researchers use the Laboratory's scientific facilities as visitors or collaborators. The Argonne site includes 99 buildings having 4.6 million total square feet of floor space. An additional 110,000 square feet of space is provided by various other structures and facilities throughout the site. Building 900, with 73,229 square feet of ingrant leased space, is off-site to the southwest, approximately 3.5 miles from the center of the site. Argonne facilities are nearly 99% occupied as measured by the Argonne space management system. The replacement value of all existing facilities and other structures at Argonne is estimated to exceed $1.3 billion.

Research programs supported by DOE's Office of Science (DOE-SC) account for more than half of the space usage at Argonne. Figures 1.2 and 1.3 summarize the distribution of building space at Argonne by General Services Administration (GSA) use code (Administrative, R&D, Housing, and so on) and by building age.

In addition to the space in Building 900 leased to alleviate a space shortage near the Argonne site, an additional 22,000 square feet is leased, primarily for offices in the Washington, D.C., area and in Colorado. Occupancy of off-site space has remained generally stable for several years.

FIGURE 1.1 Aerial Image of the Argonne Site

Adequate land is available to accommodate Argonne's plans for expanded programs in basic research and other areas. The site road and utilities infrastructure generally can accommodate modest growth. Facilities are now almost fully occupied, so additional construction will be required to satisfy the needs of growing programs.

Existing physical, site, and regional location factors present no constraints to planned accommodations. The planned Laboratory growth will not encroach on neighboring areas, because the site is separated from them by the greenbelt forest. The exceptional road connections to major expressways and the local arterial network can accommodate the increased traffic that will accompany such growth.

Argonne's total operating budget was $438 million for in FY 2004 and is estimated at $464 million for FY 2005. The budget is expected to grow to approximately $518 million in FY 2006. These data are being revised in consultation with Laboratory management and DOE funding sponsors, but they are not sufficiently finalized to quantify meaningful differences.

Argonne is operated by the University of Chicago as a government-owned, contractor-operated research facility. DOE is expected to re-compete the operating contract when it expires in 2006.

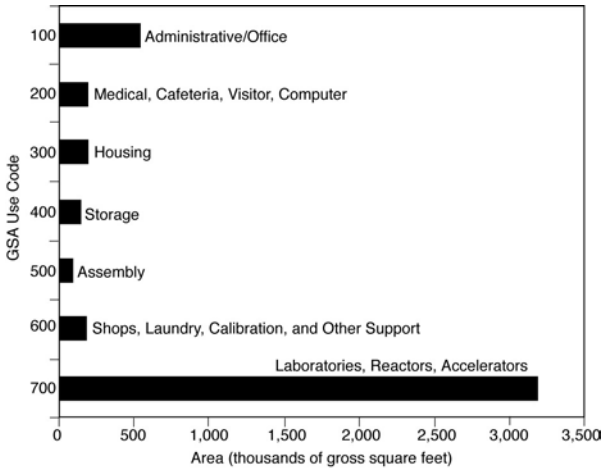

FIGURE 1.2 Distribution of DOE-SC Space at Argonne

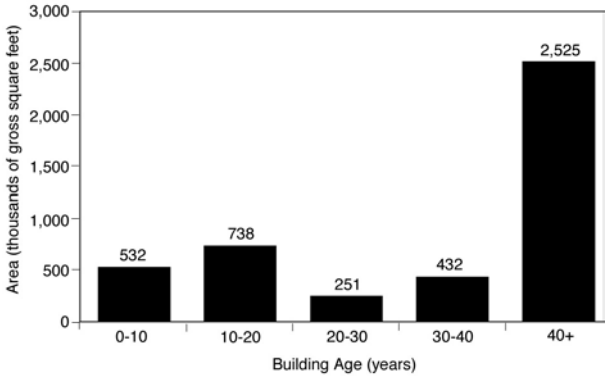

FIGURE 1.3 Age of DOE-SC Buildings at Argonne (Values exclude the New Brunswick Laboratory, Building 350, which is operated by DOE-SO. The average age of the DOE-SC buildings is 34.8 years.)

1.2 Summary of DOE-SC Facilities

The statistical summary of the DOE-SC facilities in Appendix A includes selected sitewide indications reflecting general site conditions. A more detailed description of the condition of these facilities is in Chapter 4. These data were developed with reference to the FY 2004 Condition Assessment Survey (CAS) inspection cycle. They reflect no changes from the FY 2004 *Ten-Year Site Plan* submission, because the results of the current cycle of inspections will not be available until late in the current fiscal year. The conditions were determined by using the CAS process described in Appendix B.

1.3 Laboratory Space Distribution and Age Profile

Figures 1.2 and 1.3 summarize aggregate data regarding the space distribution and age profile of Argonne DOE-SC facilities. These data reflect current (FY 2005) ages and usage characteristics.

1.4 Non-SC Facilities

A single facility at Argonne, Building 350, the New Brunswick Laboratory, is operated by the DOE Office of Security (DOE-SO). Memoranda of Understanding govern the working relationships between this facility and the ongoing landlord functions at Argonne carried out under DOE-SC. This facility is discussed in more detail in Chapter 4, Section 4.2.2. A tabular summary for Building 350 is included in the data in Appendix A.

At the request of DOE-SO, an accelerated CAS inspection of Building 350 was performed early in the second quarter of FY 2005. Preliminary (draft) results are under review and will be included in the annual Facility Information Management System (FIMS) update at the close of the fiscal year, but they could not be included in this May 2005 *Ten-Year Site Plan* by its closing date. The tables and sections cited above, and also Appendix A, retain the values from the October 2004 *Ten-Year Site Plan*.

1.5 Aerial Image of Argonne

Figure 1.1 is an aerial image of Argonne.

2 Mission

Argonne's mission is to serve DOE and national security by advancing the frontiers of knowledge; by creating and operating forefront scientific user facilities; and by providing innovative and effective approaches and solutions to energy, environmental, and security challenges to national and global well-being, in the near and long term, as a contributing member of the DOE laboratory system. Argonne is a significant contributor to DOE's missions in science, energy resources, environmental stewardship, and national security, with lead roles in the areas of science, operation of scientific facilities, and energy. In accomplishing its mission, Argonne partners with DOE, other federal laboratories and agencies, the academic community, and the private sector.

Argonne ensures U.S. scientific and technological leadership by creating — in the national interest — new knowledge and technologies that enhance energy security, national security, economic productivity, and quality of life. The Laboratory is a full participant in the implementation of administration priorities set forth by the President's science advisor. In all its programs, Argonne is committed to managing its resources to maximize benefit to the taxpayer, with DOE's critical performance measures as its guide.

Argonne's leadership inspires cooperation to integrate the resources of other laboratories, agencies, and universities to solve the nation's most challenging problems. The Laboratory's scientific research supports every major DOE program. Our management approach is to focus the Laboratory's attention on research that has the greatest promise and the highest potential impact for the coming decade. To maximize benefit to the nation, we create alliances with industry that expedite application of new discoveries and technological innovations.

2.1 Strategic Goals

Argonne is pursuing the following ten visionary strategic goals to deliver extraordinary science and technology with significant value to the nation:

1. *Hydrogen Research and Development*

Argonne will help advance the basic and applied science and the technology development needed to produce, store, and distribute hydrogen and to use it in fuel cells, vehicles, and electricity generation. The Laboratory will focus its diverse intellectual resources, experimental capabilities, and user facilities to achieve breakthroughs in fundamental understanding of the materials and processes needed for a viable hydrogen economy. We will continue to participate in the FreedomCar partnership, in order to accelerate the development of practical, affordable hydrogen cell vehicles. We will perform the engineering and analysis required to develop a nuclear plant that co-generates hydrogen and electricity.

2. *Advanced Nuclear Energy Systems*

Argonne will contribute to the development of advanced technologies to treat spent nuclear fuel and transmute isotopes that contribute to long-term environmental issues and will design a fast-burner system to close the nuclear fuel cycle. This approach will reduce the need for geologic repositories, contribute to U.S. energy independence by recycling spent commercial nuclear fuel, and reduce the stockpile of weapons-grade plutonium and actinides.

3. *Nuclear Energy*

Argonne will help develop advanced nuclear power technologies that are safe, economical, proliferation-resistant, and environmentally sustainable and will help design and test the future plants being contemplated by DOE. Argonne will continue to support the fusion energy sciences with research in plasma and reactor physics and engineering.

4. *Nuclear Physics and the Rare Isotope Accelerator*

Argonne will build and operate the Rare Isotope Accelerator (RIA) as a forefront user facility, thereby opening new frontiers for

research in nuclear physics and astrophysics and extending the Laboratory's tradition of innovation, scientific leadership, and service to facility users. RIA will allow researchers to obtain critical scientific information about how heavy elements are created and how nuclear properties influence the stars; the properties of short-lived atomic nuclei near their limits of stability; and the nature of nuclear decay, reactions, and structure.

5. *Nanoscience and Nanotechnology*

Argonne will enable the rapid characterization of new materials required for the nanoscale revolution by co-locating multiple research disciplines and nanoscience instrumentation at two of its national user facilities: the APS and the IPNS. DOE has approved the mission need ("Critical Decision 0") and the preliminary baseline range ("Critical Decision 1") for Argonne's Center for Nanoscale Materials. Construction of this state-of-the-art user facility adjacent to the APS began in FY 2004. The state of Illinois is funding the building, and DOE is funding the scientific equipment, including a world-class nanoprobe beamline at the APS.

6. *Bioscience*

Argonne will develop a proteomics user facility adjoining the APS, which serves as a world-class user facility for forefront research in structural biology and many other areas, and is planning for significant growth in research for DOE's Genomics:GTL (formerly Genomes to Life) program. Argonne is the site for a regional biocontainment laboratory, the Howard T. Ricketts Laboratory, that will conduct microbiology research to combat emerging infectious diseases and reduce the threat from bioterrorism. This facility was successfully proposed to the National Institutes of Health by a consortium led by the University of Chicago.

7. *Advanced Scientific Computing*

Argonne will provide the high-performance computational and networking resources that are indispensable for scientific discovery. The Laboratory has had international impact through its leadership in the areas of Grid computing, scalable numerical tools, parallel computing, and advanced visualization. Moreover, it is strengthening its work on computational science applications, especially in the areas of nanoscience and biology. Argonne will continue to support the Scientific Discovery through Advanced Computing program — a multidisciplinary effort involving teams of mathematicians, computer scientists, and applications area scientists in the development of a new set of scientific simulation codes that can fully exploit the Laboratory's rapidly expanding computing resources. Argonne will also spearhead state-of-the-art computing initiatives to develop architectures, applications, software systems, and test beds for petaflops-scale computing.

8. *National Security*

Argonne will help enhance national security by delivering new technologies and threat analyses for the Department of Homeland Security, the Department of Defense, and the U.S. intelligence community. Many Laboratory discoveries and inventions developed in pursuit of Argonne's research missions are now helping to increase homeland security. Notable technologies include portable systems for detection and field identification of concealed nuclear materials, pathogenic microorganisms, and airborne poisonous chemicals; models to guide infrastructure assurance; and the PROTECT system, which combines detection, communication, and quick-response strategies to protect subways and other enclosed public spaces against chemical and, eventually, biological attacks. Argonne is also exploring the sociological dimensions of terrorist threats by partnering with leading social scientists at the University of Chicago.

9. *Environmental Research*

Argonne will provide leadership in key areas of environmental research by integrating fundamental research with reliable impact assessments and innovative technological solutions and will make major contributions in such areas as the cycling and sequestration of carbon, the causes and consequences of global

climate change, atomic-level controls for contaminant sequestration, and potential environmental impacts of a hydrogen fuel economy. More generally, we will perform modeling, simulation, analyses, and assessments for energy, environmental, and economic systems. This research will take full advantage of the APS and other state-of-the-art facilities and tools available at the Laboratory.

10. *National User Facilities*

Argonne is committed to maximizing the scientific and technical productivity of its existing user facilities, especially its four leading national user facilities: the APS and IPNS (discussed above); ATLAS, which would become part of RIA; and the Electron Microscopy Center. Meeting this goal involves maintaining the facilities' high reliability and availability, while increasing their performance and experimental capabilities. At the APS, for example, Argonne plans upgrades over the next two decades that will increase the productivity of users by roughly 10,000-fold. The benefit will be much more information, obtained much more quickly, to support important scientific activities such as imaging nanoscale devices and solving the atomic structures of the huge biological molecules crucial to understanding diseases. Argonne will remain an international leader in accelerator-based user facilities, through the APS, RIA, connections with high-energy and nuclear physics, and involvement in development of the next generation of x-ray sources after the APS.

2.2 Scientific and Technical Core Competencies

To achieve Argonne's vision, the Laboratory must cultivate distinctive, world-class scientific and technical capabilities and integrate them into a dynamic portfolio of core competencies that serve and anticipate current and emerging national R&D needs in our mission areas. Argonne's current competency portfolio includes the following:

- A complete set of engineering and scientific expertise supporting the design, development, and evaluation of current and advanced nuclear energy systems and proliferation-resistant nuclear fuel cycle technologies, including pyroprocessing.
- Design, construction, and operation of accelerator-based user facilities, along with diverse state-of-the-art capabilities related to acceleration, particle detection, synchrotron radiation techniques, spallation neutron scattering techniques, and the control and manipulation of particle beams and photon beams.
- Fundamental science and engineering expertise in, and at the interfaces between
  - Materials sciences, chemical sciences, biological sciences, and atomic physics;
  - High-energy and nuclear physics;
  - Multidisciplinary nanoscience and nanotechnology;
  - Structural biology, functional genomics, and bioinformatics;
  - Environmental science and technology;
  - Applied mathematics and computer science, including collaborative and Grid environments; and
  - Computational science, including modeling, simulation, systems analysis, and complex adaptive systems.

Argonne's goal in managing its portfolio of core competencies is to be best in the world in selected areas, to be among the leaders in other areas, and to have sufficient breadth and balance to both support users of the facilities we steward and tackle complex multidisciplinary challenges in our mission areas — typically in collaboration or partnership with others.

2.3 Roles in Accomplishing DOE Missions

Argonne has a contractual responsibility to serve DOE's mission areas, especially its overarching national security mission. In science and in energy, Argonne has a principal role; in environmental quality the Laboratory is a major contributor. Developments after September 11, 2001, demonstrated how fundamentally the

knowledge, technologies, and facilities at Argonne — even those originally developed for other purposes — serve as a major resource for national security.

- *National Security*

The recent evolution of threats to U.S. national security has amplified and focused the Laboratory's involvement in DOE's national security mission, drawn particularly on substantial expertise in the nuclear fuel cycle and in the diverse enabling technologies and sciences underpinning those areas — notably chemistry, biology, systems analysis, radiation effects, and transport modeling. Argonne also has specialized R&D capabilities contributing to the development of new technologies for detection and attribution, such as highly sensitive instruments and verification technologies to detect radiation and chemical threats or provide biological clues to possible weapons proliferation or actual attacks. Skills in modeling and decision science are contributing to the security of critical infrastructure at local, regional, national, and global scales. Argonne also provides regional resources for response and recovery following nuclear and radiological emergencies. In addition to this scientific and technical expertise, Argonne has proven experience with other nations in cooperative R&D that will be valuable in supporting DOE goals relating to nonproliferation cooperation, export controls, and materials protection.

Scientific, engineering, and operational capabilities that have been developed over many years at Argonne for other purposes are more recently yielding results that help to counter the threats of terrorism. In the future, this expertise — set within Argonne's unique facilities — and available technologies promise to address a broader range of important goals in national security and homeland defense, across the full spectrum of concerns about threat anticipation, threat mitigation, protective security response, and recovery.

- *Science*

For DOE's science mission, Argonne has major scientific user facilities and significant experimental and theoretical research programs in nuclear and high-energy physics; in applied mathematics; and in materials, chemical, computer, computational, biological, environmental, and fusion science. In several key fields and subfields important to DOE, our research is among the most cited, and our scientists are international leaders, known for effective collaborations with other DOE laboratories, strong interactions with the academic community, productive R&D partnerships with private industry, and high-quality research experiences provided for hundreds of undergraduate and graduate students each year.

The APS, IPNS, and ATLAS are among DOE's most successful major national scientific user facilities. The APS, the nation's premier hard x-ray synchrotron radiation facility, now serves more than 6,000 users from universities, corporations, and national laboratories throughout the country; these users routinely report newsworthy new science. The IPNS continues to provide extraordinarily reliable neutron beams and user support for approximately 400 experiments each year, while continuing its tradition of leadership in the development of spallation targets, neutron moderators, and neutron scattering instruments. In addition to operating the APS and IPNS, Argonne is helping educate the next generation of users by hosting the National School for Neutron and X-ray Scattering. At the ATLAS, unique low-energy heavy-ion beams enable 150–250 scientists each year to conduct forefront research in nuclear, atomic, and applied physics. The RIA initiative — recently identified by the nuclear physics community as its highest priority among major new construction projects — derives considerable scientific motivation and much of its technology base from ATLAS.

For several years Argonne staff has made significant contributions to major subprojects associated with user facilities or detectors located elsewhere; the most visible current example is ongoing participation in the Spallation Neutron Source (SNS). Argonne also has leading responsibility for SNS spectrometer systems and provides substantial

technical support for SNS target systems. Other examples include contributions to a detector for the Large Hadron Collider, participation in the Linac Coherent Light Source, and detector fabrication for the MINOS neutrino experiment.

Science at Argonne benefits from access to major facilities and from the Laboratory's integrated approach to complex problems. The grand challenges in modern science, such as nanoscale materials or fundamental understanding of biological processes at the molecular scale, are beyond the reach of isolated experiments. Success requires not only forefront capability but also a suite of experimental and theoretical approaches. Argonne research strength comes from diverse scientific teams that examine a problem from many complementary perspectives. This synergy of many approaches working together generates remarkable scientific power and often leads to the creation of pathbreaking new research facilities. The APS, IPNS, and ATLAS all had their origins in Argonne science. Four of the current major Laboratory initiatives build on Argonne strengths that serve DOE's science mission, both through performance of forefront research and through service to users. Those four initiatives are the Center for Nanoscale Materials, the Rare Isotope Accelerator, Functional Genomics, and Petaflops Computing and Computational Science. In addition, major components of the initiative Hydrogen Research and Development fall under DOE's science mission. These initiatives are described more fully in Argonne's October 2004 *Institutional Plan*, online at http://www.ipd.anl.gov/instplan/.

- *Energy*

Argonne has substantial programs and facilities serving DOE's mission to develop innovative, energy-efficient, cost-effective, and environmentally friendly technologies for electric power, transportation, and industry. Argonne operates numerous unique energy R&D facilities that are used by researchers from universities and industry.

Argonne has noteworthy expertise and facilities in nuclear reactors, non-reactor nuclear facilities, and nuclear fuel cycle technologies. Over the years, we have developed safe and reliable fast-reactor technologies and have demonstrated the technical basis for a proliferation-resistant closed nuclear fuel cycle, based on pyroprocessing, that can consume weapons-grade plutonium and spent fuel from the nation's current fleet of power reactors. Argonne is contributing solutions that will allow nuclear energy to be a significant component of the nation's energy supply portfolio in both the near and long terms — safe, environmentally acceptable, proliferation-resistant, sustainable, and economical.

Argonne's broader energy R&D portfolio is built on expertise in superconductivity, fuel cells, batteries, fossil fuels and carbon management, renewable energy technologies, energy testing and analysis, and other key technologies. Transportation technology R&D relies on many of these competencies and on unique Laboratory facilities to support DOE's quest to increase the efficiency and productivity of vehicular energy use while limiting environmental impacts. The breadth of this portfolio in both energy technology and supporting basic science is reflected in the range of contributions being proposed in support of the nation's new national hydrogen economy initiative. Among these proposals are a Laboratory initiative in Hydrogen Research and Development that encompasses extensive work on the materials science and chemistry of high-performance structural materials and catalysts, bolstered by use of the APS, IPNS, and other major research facilities; investigation of the production of hydrogen from nuclear power, taking advantage of our extensive expertise in nuclear reactor technology; and exploration of effective systems for utilizing hydrogen in both transportation and stationary applications, capitalizing on experience and facilities developed in earlier partnerships with industrial firms.

- *Environmental Quality*

In support of DOE's environmental quality mission, Argonne is working to develop innovative characterization and remediation tools and technologies, create advanced technologies that intrinsically produce little or

no pollution and minimize waste generation, clean up land and facilities on the Argonne site, and conduct thorough and objective environmental analyses. The focus of this work is shifting from effluent control technologies and associated regulation toward resource and waste management, site remediation, long-term stewardship, and global environmental issues. The Laboratory's greatest strength in this research area is its intrinsic combination of capabilities in bioprocessing, ecology, modeling and measurement of environmental pathways, atmospheric physics and chemistry, environmental assessment, and decision models.

Examples of work in the environmental quality area range widely. Argonne is responsible for operating the Climate Research Facility of DOE's Atmospheric Radiation Measurement Program. In other work, researchers are using the APS to pioneer synchrotron-based environmental tools that will deepen microscale understanding of environmental processes. The Laboratory also belongs to the EnviroCAT partnership, which will develop state-of-the-art APS beamlines designed to tackle a broad range of environmental science problems. Elsewhere, the U.S. Department of the Interior has tapped Argonne to help develop air quality models and apply them to energy–environment issues in the western United States, especially the Rocky Mountain overthrust belt.

• *Enabling the Mission through Excellence in Operations.*

Built into all Argonne programs and support activities is a commitment to operational excellence, to exemplary relations with the public, and to development of the diverse science and engineering workforce needed to accomplish DOE missions and assure U.S. prosperity, security, and leadership into the future. In the operations area, our contractual goal is to conduct all work and operate all facilities cost-effectively and with distinction, in a manner that integrates with and supports our missions in science, technology, energy, and environment, while fully protecting workers, facility users, the public, the environment, and national interests.

For the past half century the University of Chicago has managed and operated Argonne under contract to the federal government. Throughout this period the Laboratory's research environment and performance have maintained a high standard of intellectual excellence and integrity, and the site — despite its age — is among the best maintained in the DOE complex. Currently, the University and the Laboratory are strengthening ties at all levels, from student research to joint appointments, collaborations between individual investigators, and strategic alliances.

2.4 Strategic Context and Planning Assumptions

Argonne is one of DOE's nine major multiprogram national laboratories and is one of ten facilities affiliated with DOE-SC. Like most DOE R&D sites, Argonne is managed and operated by a contractor. Argonne serves all four of DOE's mission areas and is internationally recognized for its science, scientific user facilities, and energy R&D. Argonne's track record of performance, human resources, and R&D facilities is the asset upon which the Laboratory's strategic plan for the future is built. This *Ten-Year Site Plan* provides the framework for maintaining, sustaining, and enhancing the physical plant and infrastructure underpinning the facilities and programs that will accomplish the Laboratory's goals.

Argonne's planning is based on five key assumptions:

• DOE's national laboratories must act increasingly as a synergistic system, with the laboratories managing their collective competencies, increasing their overall cost-effectiveness, and partnering on major initiatives among themselves and with the private and academic sectors.

• Sponsors, regulators, and the public will continue to require that we demonstrate responsible corporate citizenship. This imperative includes being a good and trustworthy neighbor, conducting operations cost-effectively and responsibly, and meeting or exceeding regulatory requirements.

- Argonne must compete on its merits for federal funding, for the "best and brightest" employees, and for the modern infrastructure needed for future success. Important factors in this competition will be scientific and technological excellence, cost-effectiveness, mission contributions, record of performance, and a working environment that maximizes the performance of a diverse and talented workforce.
- Robust links with universities, industry, federal laboratories, and the general scientific and technical community (within the United States and abroad) are essential if we are to maintain our leadership and fully exploit advances made throughout the world.
- Computing, computational science, and communications and information technology will advance rapidly, will become seamlessly intertwined with experimental science, and will thereby revolutionize many fields of research and applications that are central to the missions of DOE and Argonne.

2.5 Strategic Objectives

Argonne will continue to perform outstanding science and technology consistent with its continuing mission and will continue to provide results and value to the nation. This objective includes operating world-class scientific user facilities, using and contributing to facilities elsewhere, and providing other science- and technology-based tools in a way that maximizes service to users and research productivity, as well as other public benefits. Outstanding science and technology are Argonne's reason for existence. In support of this objective, we expand the frontiers of knowledge, develop and test new technologies, and create new areas of inquiry that keep Argonne at the forefront of research serving the thousands of scientists and students from universities, industry, and other laboratories around the country and the world who use Argonne's unique facilities to conduct their research. Reliable facility operation, meeting or exceeding performance specifications, and high-quality user support are critical to achieving these missions. In addition to the APS, IPNS, and ATLAS, Argonne operates or provides other important special research tools, such as major nuclear research facilities, environmental research sites, mathematical libraries, software packages, and decision tools.

Argonne is committed to providing the highest possible mission value with the resources it receives. Under constrained or declining budgets, this goal can be achieved only by nurturing the best, most important programs and phasing out the least important. In the near term, Argonne will emphasize the following activities:

- Expand and strengthen the computational components of its R&D.
- Design, construct, and operate user facilities effectively.
- Contribute to the development of advanced nuclear energy systems.
- Develop advanced nuclear energy sources for space exploration and national security.
- Apply diverse expertise to homeland security.
- Build integrated cross-disciplinary teams.
- Solve problems of national importance.
- Catalyze the expeditious transfer of our technologies into beneficial use.

Argonne will develop important new R&D initiatives and scientific facilities that serve emerging national needs consistent with our mission and will implement them cost-effectively and expeditiously to benefit DOE and the nation. New initiatives are an engine for change. They attract bright research staff and facility users, and they help direct our programmatic focus onto current and future needs. Current major Laboratory initiatives promise extraordinary, broad benefits and build naturally on current mission areas and strengths. This initiatives portfolio includes the following:

- The Center for Nanoscale Materials
- The Rare Isotope Accelerator, in conjunction with Illinois Science Center financed by the state of Illinois
- Functional Genomics
- Petaflops Computing and Computational Science, along with the Theory and Computing Science Center proposed for

development under third-party financing through state of Illinois bonding authority

- Advanced Nuclear Energy Systems
- Hydrogen Research and Development

Argonne and the University of Chicago will strengthen and fully exploit partnerships and alliances to maximize the Laboratory's value and impact — nationally, regionally, and locally. A strong intellectual alliance between the University of Chicago — one of the nation's premier research universities — and Argonne — one of DOE's major multiprogram science laboratories — promises benefits to DOE and to the broadly ranging impacts of both institutions. Argonne and the University increasingly take advantage of each other's complementary expertise in areas such as nanoscience, computing and computational science, bioscience, environmental science, homeland security, and economic modeling of energy systems. The two institutions plan to increase joint recruiting, joint proposals, joint appointments, joint projects, and sharing of facilities and other resources.

The University of Chicago and Argonne will continuously improve the cost-effectiveness, management, and operations of the Laboratory. The University is working with DOE to continuously improve and streamline Argonne's administration and operation. Major challenges include recruiting and developing a diverse workforce, modernizing the physical infrastructure, and fully exploiting partnerships. The changes undertaken in this quest will build on best practices gleaned from the private, academic, and public sectors. The result will be an integrated, creative, and highly productive laboratory whose performance significantly exceeds the sum of its parts, because it engages — productively, cost-effectively, safely, securely, and environmentally responsibly — as a contributing member of the DOE laboratory system and as a partner and leader in addressing national needs in science and technology.

2.6 Future Mission Projections

The major programmatic growth envisioned over the next ten years will be funded by DOE programmatic initiatives such as the RIA project proposed for the northwest portion of the 200 area. These initiatives will depend on stable, well maintained infrastructure. Each major initiative will bring infrastructure capacity challenges. The Laboratory will ensure that base planning supports interconnections, modern design, and known capacity limitations. Increases in site building area and populations associated with these initiatives and in operating funding and additional user levels are not included in the projections (Section 2.7) for anticipated steady-state operations, which form the basis of the *Ten-Year Site Plan* and the focus on retention and recapitalization of the existing infrastructure. Specific assumptions related to more detailed project planning are in Chapter 5.

Three of the Laboratory's current major initiatives involve the use of alternative financing to create the needed infrastructure for the 21st century. These initiatives are the following:

1. The Center for Nanoscale Materials, financed by the state of Illinois and now undergoing construction and nearing completion

2. The Illinois Science Center proposed to complement the RIA project, with financing by the state of Illinois

3. The Theory and Computing Science Center, proposed for development under third-party financing under state of Illinois bonding authority

These facilities will spearhead the modernization of the Laboratory in the coming decade. Additional modernization for existing facilities will be implemented through General Plant Projects (GPP), line item, or other sources of funding.

Argonne will host the Howard T. Ricketts Laboratory, a nationally important new R&D scientific facility that will serve emerging needs consistent with Argonne's mission, to be operated by a consortium led by the University of Chicago and funded by the National Institutes of Health.

2.7 Funding and Staffing Trends

Table 2.1 shows that as of FY 2004 Argonne operations are projected to remain stable on a

baseline of existing capabilities. Table 2.2 shows that the population base at Argonne is also expected to remain stable in the short term, benefiting from increased operational missions via the research initiatives outlined above. Sufficient capacity exists in the support infrastructure systems to accommodate the on-site population growth associated with these initiatives. Because of the nature of the collaborative planning cycle now supporting the development of the Laboratory's *Business Plan*, it is premature to revise or extend the planning forecasts developed throughout FY 2004 and documented in the October 2004 *Ten-Year Site Plan* and *Institutional Plan*. These data are being revised in consultation with Laboratory management and DOE funding sponsors, but they are not sufficiently final to quantify meaningful differences.

The remaining sections of this document focus on infrastructure-related opportunities and conditions consistent with the stable pattern of scientific missions and initiatives that have characterized Argonne's proven and emerging research role in recent years.

TABLE 2.1 Argonne-East Funding Summary ($ in millions BA)

	FY 2004	FY 2005	FY 2006
DOE Funding	318.0	337.9	392.6
Work for Others Program	98.8	103.9	102.8
Department of Homeland Security Funding[a]	18.3	20.5	20.5
Additional Funding from Non-DOE Organizations	2.8	2.3	2.3
Total Operating	437.9	464.6	518.2

[a] Includes direct funding from the Department of Homeland Security (DHS) and DHS work administered through the Work for Others program.

TABLE 2.2 Argonne-East Personnel Summary (in FTE)

	FY 2004	FY 2005	FY 2006
Direct Personnel			
DOE Effort	1,355	1,391	1,449
Work for Others Program	306	329	312
Department of Homeland Security Effort[a]	12	13	13
Additional Funding from Non-DOE Organizations[b]	1	2	2
Subtotal	1,674	1,735	1,776
Other Direct[c]	335	347	355
Total Direct Personnel	2,009	2082	2,131
Indirect Personnel	904	937	957
Total Personnel	2,913	3,019	3,088

[a] Full-time equivalents reflect direct funding from the Department of Homeland Security (DHS) and DHS work administered through the Work for Others program.

[b] Includes FTEs associated with services provided to APS users and work for partners in cooperative R&D agreements.

[c] The “other direct” personnel category includes FTEs for general Laboratory services, program management and administration, staff temporary assignments, and Laboratory Directed Research and Development.

3 Land Use Planning

The latest land use plan (see Figure 3.1 at the end of this chapter) reflects the continuity of land use plans developed under current and former DOE orders and subsequent directives from DOE-SC and its predecessor organizations regarding laboratory integrated facilities plans and strategic facilities plans.

3.1 Background

The policy of DOE is to manage all of its lands and facilities as valuable national resources. DOE's stewardship is based on the principles of ecosystem management and sustainable development, together with the integration of mission, economic, ecologic, social, and cultural factors into a comprehensive plan for each site that guides land and facility use decisions. This policy results in land and facility uses that support DOE's critical missions, stimulate the economy, and protect the environment. Under this policy, the comprehensive plan for Argonne (land use plan, site development plan) reflects the site's ongoing missions in the larger regional context and incorporates the forums for stakeholder participation developed by DOE under the auspices of future use planning as documented in *Charting the Course: The Future Use Report*, April 1996.

The comprehensive land use planning process identifies the current condition of existing land and facility assets and the scope of constraints across the site and in the surrounding region. Long-term sustainable development goals focus efforts to steward these assets and identify options for land and facilities use. The options considered take advantage of opportunities and mitigate constraints in support of the site's identified missions and research initiatives, as developed in consultation with DOE programmatic guidance and during the annual On-Site Review. The missions and initiatives are documented in the *Institutional Plan* and programmatic strategic plans. At Argonne, the site planning process employs iterative updates and adaptive management techniques that adjust management practices and directions to changes in missions and in environmental, economic, cultural, and social factors.

DOE has given Argonne responsibility for tailoring its land use planning process to local conditions and coordinating existing activities that affect planning for land and facility assets. These activities include the process prescribed by the National Environmental Policy Act (NEPA), site planning and asset management, public participation (via the Community Leaders Roundtable) in conjunction with the DOE Argonne Site Office, site strategic planning, cultural asset management, historic preservation, and natural resource management. Factors that can require considerable intergovernmental coordination at sites with changing or discontinued missions play a less influential role at Argonne because of the continuity of our missions. Such factors include economic development, community re-use organizations, privatization of assets, and environmental justice, to name a few.

3.2 Site Planning Process

As originally established under DOE O 4320.1, Site Development Planning; its subsequent modifications and related and successor orders (DOE O 4320.1A and DOE O 4320.1B); DOE O 4330 (Capital Asset Management Planning; DOE O 430.1A (Life Cycle Asset Management); and, most recently, DOE O 430.1B (Real Property Asset Management [RPAM]), the basis for the planning process must be documented so that others can follow the decision processes and factual conditions used to arrive at the solutions and implementation plans. These orders and related guidance acknowledge that no single planning process is to be followed stringently, but that site-specific processes should be tailored to the needs of each site, within the bounds of industry-wide acceptance and recognized planning principles. The guidance also recognizes that unique requirements pertain to special situations. For example, for research laboratories a campus setting might be the most suitable working environment. Planning

processes for such settings should reflect the unique requirements.

At Argonne, site development planning has consistently been comprehensive, addressing the entire site, including the New Brunswick Laboratory (NBL). This independent DOE-operated facility, wholly within the Argonne site, receives the same consideration as Argonne facilities in planning for land use, facility siting, and DOE missions.

Site planning is inherently a collaborative process that facilitates open exchange of necessary technical information, and all affected parties have input into the process. For the Argonne site with its ongoing, continuing missions, DOE's Argonne Site Office has established mechanisms to engage the appropriate level of community involvement in site planning.

The site planning process is defined (originally in DOE O 4320.1B) as steps used to

- Identify and define current and future site missions;
- Evaluate existing site conditions and regional influences;
- Determine and quantify facility requirements to accomplish site missions;
- Formulate alternatives to satisfy facility requirements;
- Evaluate and rank the alternatives on the basis of their merits; and
- Develop a plan of action to implement the preferred solution.

3.3 Planning Issues

No significant issues affect land use planning at Argonne. An acceptable wetland mitigation strategy is being developed and implemented to address the many small wetlands that pose an impediment to development. Management of the extensive natural areas has not been an active consideration during the most recent half century of government ownership. As a consequence, the remnant prairie and savanna habitats and surviving flora offer significant potential for habitat restoration.

From a development perspective, the Argonne site is ideally situated for its purpose as a multiprogram research laboratory. Its ready access to business, industry, and universities and its location on one of DuPage County's growth corridors ensure that Argonne will maintain its competitive position in attracting and retaining highly skilled and educated personnel, as well as its ability to foster business partnerships and high-technology enterprises in the future.

Existing physical, site, and regional location factors present no constraints to planned accommodations. The envisioned Laboratory growth would not encroach on neighboring areas, because the site is separated from them by the greenbelt forest. The exceptional road connections to major expressways and the local arterial network can accommodate the increased traffic that will accompany such growth.

In terms of land requirements, land suitable for development is not in short supply. Undeveloped areas available for functional uses equal the areas presently used. The capacity of areas dedicated for development should be sufficient to significantly increase current on-site developed space, at the current intensity. Including the reserve areas (those not immediately available for expansion) would permit significant additional expansion, if sufficient utility capacity and distribution systems were available.

3.4 Revision Process

Figure 3.1 is the master plan for development and land use. This land use/master plan will be revised in conjunction with the *Ten-Year Site Plan*, in conformance with DOE guidance, and submitted for review and approval in response to directions contained in the call from DOE-SC. The approval process for the *Ten-Year Site Plan* is described in Appendix C.

3.5 Land Use Plan

Future land development at the Argonne site reflects the existing development pattern that has adequately served the Laboratory's changing needs for more than 50 years. Two key concepts underlying the site development plan are to

1. Redevelop or expand previously developed areas of the site (for programmatic missions, housing, and support services) into dedicated expansion areas; and

2. Delineate environmentally sensitive areas and existing natural open space for ecosystem management in permanent green space or zones of transition between developed areas.

The site development plan includes a parcel inventory that identifies specific management units of the site that will be opened, developed, and maintained according to the appropriate site development standards. The former ecology plots are undeveloped parcels of land that will remain undeveloped to the extent possible. Future research objectives might require rededication of an ecology plot area to development; however, this action will be considered only if no other on-site parcel can reasonably accommodate mission requirements.

The key to an effective long-range master plan for facilities and site development is to ensure that the future potential of the site is not limited by adverse short-range actions taken for expediency. This assurance requires development of dedicated areas designed to be compatible with the established mission of the site and with agreed-upon Laboratory goals and objectives. Further, the Laboratory must have the greatest possible degree of flexibility in future site use within the overall master plan.

The site development plan at Argonne explicitly recognizes and records key safety and environmental concepts. This plan continues to include programmatic mission areas and housing and support service areas as important ongoing functional uses. Environmentally sensitive portions of the site along existing natural areas, floodplains, streams, and steep slopes will be retained in their natural state.

Argonne has identified the preferred locations of the major scientific initiatives. The Laboratory projects selective increases in some program activities within existing facilities. All such actions can be accommodated readily within present site boundaries.

3.6 Future Functional Locations

For long-range planning purposes, the Argonne site is being considered as a contiguous land area consisting of management area types. The site development plan dedicates large areas for expansion of present operations. Future land use assignments under this plan are discussed below. Additional characterizations of site and facilities are in Chapters 4 and 5 and Appendix D.

A system of homogenous management units has been identified by using existing road alignments and patterns of development. Each of these management units is evaluated for utility service support/availability, circulation accessibility, and development potential on the basis of development standards and location criteria. Of the 67 management units, 19 are “fully developed,” 7 are “partially developed,” 3 are in the process of redevelopment, and another 15 are undeveloped but available for development. Some 20 management units are considered “open space” (including 4 former ecology plots that could be developed but constitute a strategic land reserve). Another 3 units (the closed Argonne landfill, the NBL area, and Argonne Park) are considered special management units. Within each of these management units, future construction will occur as discussed below, by general functional area.

3.6.1 Programmatic Mission: 200 Area (Existing and Dedicated)

For the central 200 area of laboratory and office buildings within the Outer Circle Drive, the original site development concept remains sound. Some space is still available east of Building 202 for the addition of another facility. An area in the northwest section, near Building 203, has been cleared to facilitate extension of the capabilities of the ATLAS user facility into the next generation of particle research (RIA and the Illinois Science Center). Many of the 200 area core buildings are approximately 50 years old and thus are in need of significant rehabilitation or modernization to return them to state-of-the-art performance.

The north and northwest fringes of the 200 area have been identified as the most advantageous locations for the RIA project and the Theory and Computing Science Center. The area

east of Building 202 has been identified for the expansion and growth of biology-related initiatives such as the Howard T. Ricketts Laboratory. The space between Freund Brook and Outer Circle Drive remains dedicated for future multidisciplinary research and administrative (office) buildings that might be tied to operations in the present facilities.

Small extensions of existing major buildings or free-standing buildings associated with them can be added between Outer Circle Drive and Inner Circle Drive. At the east end of the area, the Sub-Angstrom Microscopy and Microanalysis Laboratory east of Building 212 will provide a much-needed modern platform for state-of-the-art research in a facility unencumbered by the vibrational and electromagnetic interference found in older existing facilities. As a part of these mission expansions, care will be taken to ensure that adequate parking is available near the buildings and that the campus setting and historical character of the site are not jeopardized.

3.6.2 Programmatic Mission: APS Area (Existing and Dedicated)

Much of the 400 area in the southwest corner of the Laboratory is dedicated to the APS, which consists of two principal parts: a linear accelerator/booster synchrotron system to accelerate positrons to energies of 7 GeV or higher and a storage ring more than 2,625 ft in circumference, into which the positrons are injected. The positrons circulate around the ring, emitting beams of energetic synchrotron radiation or photons. The photon beams emerge along tangent lines from the ring for use in experiments. The APS project occupies approximately 79 acres and consisted of 15 permanent, interconnected utility support buildings. The nearby Argonne Guest House is a support facility developed with state of Illinois funds to serve the specialized residential needs of teams of visiting users working around the clock. Additional initiatives planned for this area include the Center for Nanoscale Materials, now under construction, and the last of the planned laboratory-office modules (LOMs) supporting the user facilities around the storage ring, LOM 437, which will be entering construction at the close of FY 2005.

3.6.3 Other Programmatic Mission Areas (Existing and Dedicated) East Area, 300 Area, 360 Area, 400 Area, and 800 Area

Special-purpose facilities in the southern sections of the site include the initial reactor programs such as the Experimental Boiler Water Reactor, Chicago Pile-5 (CP-5), and Juggernaut Reactor in the 300 area and the former Zero Gradient Synchrotron (ZGS) facility in the 360 area. These facilities have been shut down. Most of these developed areas will remain dedicated to programmatic needs. Some of the programmatic functions might be integrated into existing facilities; others will require new dedicated space. Therefore, keeping future land use flexible is imperative.

The largest portion of the east area is dedicated for use as a specialized programmatic location for major initiatives that would benefit from a public access interface with Cass Avenue. Such a location would be fenced off from the main site to achieve a modified security level unattainable elsewhere. Such a capability is seen both as a major resource to accommodate increasing Laboratory interactions with industrial and academic interests and as a strategic land reserve suitable for large initiatives on the scale of RIA, with appropriate utility services and other infrastructure.

3.6.4 Support Services Functions (Existing and Dedicated) 100 Area, 500 Area, and Portions of the East, 300, 360, and 800 Areas

The area north of Eastwood Drive and the Eastwood Extension and east of the Outer Circle Drive remains dedicated as one of the main service areas for the entire site. This area is anchored on the west by the Central Heating Plant. The Transportation and Grounds Facility (Building 046), completed in 1993 and subsequently expanded in 2002 and reconfigured as the Central Supply Facility, is the anchor for this area's continued redevelopment as a support area.

All remaining substandard, temporary buildings in the 800 area have been demolished, and the site is cleared for reuse. Additional land dedicated to service facilities includes the following:

- The wastewater treatment area (500 area)
- Waste Management Operations, the Fire Department, and the Security Facility (300 area)

Adequate room is available for expansion of each of these support functions.

3.6.5 Housing/Amenities Functions: 600 Area

The housing functions in the 600 area are not expected to change, and the area will be maintained as a site amenity retaining much of the character of the original Freund estate. Additional housing (Argonne Guest House) is located north of the APS complex to accommodate APS users. No current plans exist to increase the housing function of the Laboratory.

3.6.6 Managed Open Space (Including Former Ecology Plot 9)

The managed open spaces throughout the center of the site and separating the various development areas will be maintained in their present condition as buffers between the developed portions of the site and more sensitive wetland and floodplain areas. Efforts are underway to reestablish native plant species in many of these areas.

3.6.7 Environmentally Sensitive Areas in and Adjacent to Identified Floodplains

Environmentally sensitive areas will remain undeveloped. Ongoing monitoring will ensure the environmental integrity of the interconnected watercourse system that helps delineate the developed areas and enhances the beauty of the site.

3.6.8 Argonne Park (East of Cass Avenue)

Argonne Park has for many years been a much-used employee resource and is dedicated for continuation of this use. The Child Development Center, which opened in late FY 1992, keeps this area in continued year-round use by Argonne and DOE employees. No plans are in place to significantly alter the facilities or operation of this area, although land is available to accommodate selected additional facilities.

3.6.9 Former Ecology Plots (1, 4, 5, 6, 7, 8)

The "ecology plot" designation appears to have originated in the early 1960s, when several vegetation surveys of the site were performed. At that time, there was interest in prairie restoration and in establishing a site ecology program. Ecological research and teaching have continued within the ecology plots since that time. In recent years, these activities have focused on Ecology Plot 1, Ecology Plot 5, and the branch of Sawmill Creek containing the Freund ponds.

Ecology Plot 1, which is also the site of the meteorological tower (Building 489), contains several habitats, including a marsh wetland and a prairie pond ringed with cottonwood trees. The pond is of particular ecological value because it is relatively undisturbed and very different from other ponds on the site or within the nearby forest preserve. This pond does not receive any sediments from surface drainage and has not been disturbed by either goose or beaver activity. Research is comparing this pond with the newly created mitigation pond on the APS site. For several years, this area has also been used for research projects as part of college curricula in ecology and botany.

Ecology Plot 5 contains several upstream ponds created by beaver activity, which were the focus of dissertation work with the University of Chicago. The pond is also the site of an ecology field experiment conducted by the University of Chicago on the effects of predation on competition among duckweed species.

Below the one remaining Freund pond, Sawmill Creek has been the site of additional field experiments conducted by University of Chicago faculty. Ecology Plot 1 and Ecology Plot 5 continue to be used for research and teaching in the ecological sciences. No ongoing ecological activities are centered on the other ecology plots at this time.

The ecology plots will continue to be used as described unless programmatic initiatives require their conversion to alternative uses. Many of these areas include stands of pine plantations established

35–40 years ago that are in need of selective thinning.

3.6.10 Areas under Stewardship Management

In addition to the eight management area types discussed in Sections 3.6.1–3.6.8, three special "overlay" areas reflect the Argonne landfill and several formerly contaminated areas now under long-term stewardship management. These areas are designated in Figure 3.1 with red cross-hatching. Consistent with their status as stewardship sites, no change is envisioned for the foreseeable future.

3.7 Land Management

Since the site's inception, Argonne has pursued a policy of development that retains large open, undisturbed areas between developed research areas. This was a useful safety feature. Early environmental and meteorological monitoring and safety alert systems were established to provide warnings for potential radiological incidents that would be primarily prone to atmospheric transport, hence requiring early determination of near-ground-surface air flows for reliable predictive responses. These requirements, in turn, established the need for minimal ground-plane disturbances to undeveloped portions of the site, especially upwind (to the west).

Subsequent development patterns and increasing environmental research programs and capabilities have reinforced the pattern of using the unaffected areas as *in situ* laboratories for environmental studies. This use pattern has led to the identification of archaeological and environmental resources and has promoted a *de facto* process of preservation — by avoidance of disturbance — for such areas wherever possible. In the last decade, awareness has focused on these areas and their remnant vegetation as relic resources, potentially very much intact since presettlement times, if indeed now vulnerable to the increasing spread of nonnative plant species and neglect.

After several years of *ad hoc* management initiatives funded through operating budgets, Argonne has formalized an advisory committee to more systematically address emerging management issues related to habitat and to preview and propose, as appropriate, innovations in management of undeveloped areas of the site. The committee is also charged with identifying opportunities to increase environmental awareness within the Laboratory community. This committee creates a forum to address the new DOE requirements to develop a comprehensive long-term native landscape plan.

Projects have been closely coordinated with environmental compliance activities related to wetlands mitigation, which complement the committee's efforts to date. The committee is establishing site baseline conditions that will drive priorities for the site. Major issues include the control of invasive species and the management of areas that have not been addressed adequately. Argonne expects that DOE will continue its high level of interest, as evidenced in performance contract measures (see also Appendix E) and participation on the advisory committee.

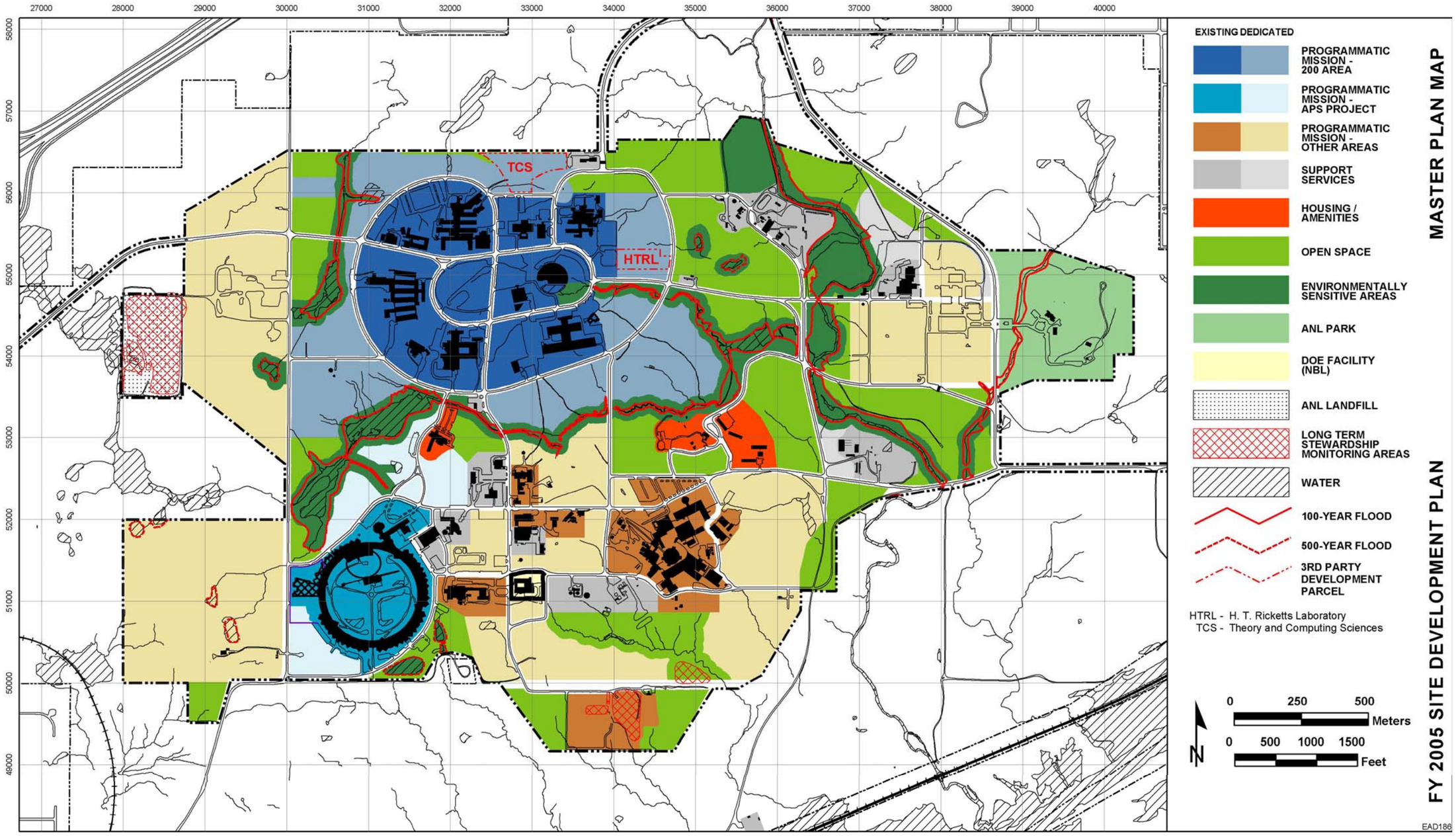

FIGURE 3.1 Master Plan for Development and Land Use

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4 Facilities and Infrastructure

4.1 Facilities Supporting Mission Activities

For each facility mission status category, each asset was independently evaluated with regard to its role in sustaining the overall mission of that category. In this evaluation (Table 4.1), assets were generally organized according to their functional occupancy, as follows: (1) direct programmatic mission (occupied by organizations having a DOE-SC or other mission), (2) indirect mission support (occupied by operations organizations), (3) mission support facilities (waste processing, housing, and amenities), and (4) site infrastructure and utilities, subdivided according to service type.

Boundaries between mission status categories are left flexible in the DOE guidance. Argonne used the following descriptions to identify the real property elements that support mission activities:

- Assets whose loss or disruption would pose immediate, serious, or irreversable setbacks to the performance of required missions are categorized as *critical*.
- Assets whose loss or disruption would have a less severe effect are generally categorized as *mission dependent, not critical*.
- Assets being phased out or subject to planning for phaseout are viewed as having negligible effect on meeting functional missions and are categorized as *not mission dependent*.

All real property assets have been clasified on the basis of their functional characteristics with reference to the Argonne Financial Information System (FIS), which corresponds to FIMS use classification categories at a higher organizational level. The classification system is presented in Table 4.1. Broad distinctions are made between (1) active and inactive "end use" facilities — primarily buildings (FIS 501) and ancillary enclosed structures (FIS 550, miscellaneous facilities supporting storage or ammenities at Argonne), and OSF (other structures and facilities) 3000 assets (accelerators) — and (2) other FIS categories that largely comprise service infrastructure systems and key plant production and treatment capabilities. For these overarching classifications, Table 4.1 cites corresponding tables in Appendix F (Table F.1, Table F.2, etc.), in which the detailed results of the classification process are recorded.

Mission-occupied buildings (and other facilities) were rated by their programmatic mission offices for their criticality to achieving the scientific mission being pursued in each facility. The overall single-facility determination was based on the highest classification reported among the mission-occupied facilities. The outcomes of these determinations are reported in Appendix F for each facility.

Similar determinations were made for non-mission-occupied facilities and infrastructure by the respective functional managers. They evaluated the likely impact of asset loss or disruption to mission-citical or mission-dependent facilities directly serving program missions. Services not essential to the continuance of these functions are considered *not mission dependent*.

In evaluating the categorizations, several assets that serve as distribution networks for services or media received variable ratings, depending on their locations and hence functions within the system topology. For example, electrical transformers serving older, non-critical portions of the site, such as the 800 area, do not carry the same *mission-critical* determination as do systems serving the user facilities and the central multiprogram facilities in the 200 area of the site.

Because distributed infrastructure systems occur in most support systems, additional ratings were assigned for infrastructures to reflect various gradings and mission criticality levels. These ratings include the designations (1) *mission critical, graded distribution* and (2) *mission dependent, graded distribution*. Utility services to buildings and sections of the distribution networks can be rated individually on the basis of the end

TABLE 4.1 Classification of Facilities at Argonne by Mission Category and Argonne FIS Category

Mission Category	FIS Categories Included	Appendix F Table
Active "End Use" Facilities		
Direct programmatic mission (See Appendix F for facilities having direct programmatic missions.)		F.1
Buildings	501 – Programmatic division occupancy	
Other structures and facilities 3000 (all)	680 – Scientific real property in FIMS	
Trailers	Directly occupied by programmatic divisions	
Indirect mission support (without occupancy by programmatic personnel.)		F.2
Operations-occupied facilities	501 Work for Others programmatic division occupancy	
Operations-occupied trailers	Occupied by nonprogrammatic divisions	
Non-SC programmatic mission		F.3
Building 350 only	501 – New Brunswick Laboratory	
Mission support facilities		F.4
Waste processing	550	
Housing	501	
Amenities	450, 501, 550	
Required Sitewide Infrastructure (See Appendix D for additional detail.)		
Water production, distribution, and storage		F.5
Canal water system	650	
Chilled water system	650	
Potable water system	650	
Laboratory water system	650	
Sewer collections and treatment facilities		F.6
Sanitary sewer system	640	
Laboratory sewer system	640	
Storm water	640	
Civil infrastructure		F.7
Roads, bridges	511	
Parking	515	
Walks	514	
Communications	610	F.8
Cooling plant facilities	501, 550	F.9
Electrical distribution	615	F.10
Natural gas distribution	625	F.11
Safety systems	620	F.12
Security infrastructure	480	F.13
Steam production/distribution/condensate	625, 550	F.14
Inactive (Nonessential) "End Use" Facilities (Excess)		F.15
Building 301	501	
Building 330	501	

uses they serve; parking and walks can likewise be graded by their ancillary relationships to the various end uses.

The results of this analysis are documented in Appendix F.

Argonne will coordinate data entry into the new FIMS field established to identify facilities as either *mission critical; mission dependent, not critical;* or *not mission dependent*, in keeping with additional guidance when it becomes available. These data fields should be fully populated at the close of the current fiscal year, after the final guidance is received. The determination of mission-critical status allows objective field entry into FIMS by FIMS-record-level detail.

Several facilities that are not presently mission related are identified as surplus and candidates for disposal. Chief among these are two major facilities: Building 301 (hot cell decontamination and decommissioning [D&D] project) and Building 330 (former CP-5 Reactor building). Both have been the subject of cleanup by the DOE Office of Environmental Management (DOE-EM) over the last decade, as discussed at greater length in Section 4.3, and both are scheduled for disposal upon completion of cleanup and availability of funds.

4.2 Characterization of Site and Facilities

Development of permanent facilities has largely followed the initial architectural site development planning of the late 1940s and early 1950s. The Inner Circle Drive and Outer Circle Drive established a pattern that has been sustained in most subsequent development. The first research buildings were constructed between the two roads. Early special-purpose nuclear facilities were located south of the circles to provide a meteorological advantage in the event of accidental releases. This precedent was followed in later development.

Most facilities are clustered within one of the following ten distinct areas: east, 100, 200, 300, 360, 400, 500, 600, 800, and Argonne Park (Figure 3.1). Detailed descriptions of these areas and the special concerns and opportunities associated with them are in Appendix D, along with discussions of general sitewide infrastructure or civil improvements (roads and bridges, parking, and pedestrian circulation and walks), security-related assets (guard posts and fencing), and several large utility facilities that are separate from the cluster areas.

Most of the basic research activities are conducted in the permanent buildings of the 200 area within Outer Circle Drive or housed in the 400 area as part of the collaborative access laboratories using the APS. The 300 area to the south comprises current and former special-purpose nuclear facilities, largely permanent structures. The 800 area, west of Outer Circle Drive, was erected by the initial site development contractor for storage and shop support and formerly consisted of a group of temporary buildings. This area is now cleared, pending assignment to a future mission requiring significant acreage in a brownfield setting. The east area, a second group of temporary buildings, was erected around 1950 near the eastern boundary of the present site to house support, administration, and some technical functions; it is now also almost completely cleared and available for reassignment for suitable missions or initiatives.

Construction of the ZGS in the early 1960s required bedrock support for the accelerator ring. The construction cost was minimized by choosing a location southeast of the Outer Circle Drive. Consequently, the ZGS complex, comprising R&D facilities, was located in the 360 area. After ZGS operation ended in 1979, the facilities of the complex were used by a variety of programmatic groups, most notably the IPNS user facility and the Center for Transportation Research (for drive train and engine testing).

The meteorology experiment area in the southwest corner of the site encompasses large open spaces and is used for a variety of ecological and air pollution research projects. This area is discussed in Appendix D in conjunction with the APS, the newest research complex on the site.

The 600 area consists of lodging facilities. Freund Lodge, the original guest house, was acquired with the site to accommodate visitors to the then-remote site in the early 1950s. Other facilities were added in the late 1950s and mid 1960s to meet housing needs for students and visiting research associates.

Topography and soil conditions across most of the site are suitable for construction. The clustering of facilities for program effectiveness has resulted in substantial open spaces or green belts between major facilities. Naturally wooded plots have been preserved, and considerable reforestation has taken place. These environmental features integrate the site into a natural setting and differentiate the various developed areas. Grounds maintenance outside the developed areas of the site is limited to that required for traffic safety. Maintenance includes mowing most of the 200, 300, 400, 600, and Argonne Park areas, as well as the areas around the entrance gates and building perimeters. Decorative landscaping is restricted to building entrances and courtyards. Maintenance mowing is performed in other areas as required for access and growth retardation.

4.2.1 Condition Overview

Because most building and facility infrastructure systems have a useful-life expectancy of 25–35 years, many Argonne facilities constructed in the 1950s and 1960s now require upgrading or replacement. The aging of facilities has caused the accumulation of a large inventory of needed revitalization. Figure 1.3 summarizes the ages of Argonne facilities.

Principal challenges being addressed by Argonne are the normal aging of buildings and infrastructure and the need to upgrade laboratory facilities to meet 21st century requirements.

As indicated in Figure 1.3, over 57% of Argonne facilities are more than 40 years old. Systems and equipment in these older facilities must be upgraded to serve modern R&D adequately. In recent years, Argonne has successfully reduced substandard space by replacing or rehabilitating older facilities and by adding new programmatic facilities.

Table 4.2 summarizes statistics used by DOE-SC to evaluate the condition of various types of facilities at its laboratories. The Summary Condition Index reflects the increasingly urgent need for increased capital funding to maintain reliability and support modernization as Argonne facilities continue to age. The overriding need is for facilities categorized as "Laboratories, Reactors, Accelerators," especially for rehabilitation and improvement beyond current deferred maintenance. That rehabilitation and improvement of these facilities are the focus of the modernization plans presented in Section 5.3.

Appendix D contains more detailed information on the range of facility conditions for each developed area of the site, with descriptions of sitewide infrastructure systems and utilities.

4.2.2 Non-SC Facilities

The one non-SC facility at Argonne is the NBL, a 85,372-square-foot building operated by the DOE-SO, with an average long-term occupancy of about 40 personnel. The facility was re-inspected at the request of the DOE-SC in the winter of FY 2005. Nevertheless, the condition statistics shown in Table 4.2 have not been updated, because the 2005 findings are considered preliminary. The NBL is an integral part of DOE's central authority for nuclear materials measurements and measurement evaluation and is the federal government's certifying authority for nuclear reference materials.

Building 350, which houses the NBL, is one of the older buildings on the site. It was initially used for fuel development and as a balance facility during the era of reactor research and development and was enlarged to nearly twice its original size to accommodate the transfer of NBL staff and missions in the late 1970s. The older portion of the building retains original features, largely unmodified. Summary statistics for NBL, comparable to those presented for DOE-SC facilities, are entered in Appendix A to the right of the entries for Argonne.

The NBL receives all utility services through Argonne's distribution and collection systems. Memoranda of Understanding define the procedural, service, and financial arrangements between the organizations. In addition to providing all operating utilities, the Laboratory provides other facility-related services, such as custodial services and building maintenance; responds to utility service breakdowns or calls; and provides for waste management as it does for Argonne programs. Under the Memoranda of Understanding, operations for site safety, security, environmental controls, waste handling, and

TABLE 4.2 Facility Condition Statistics at Argonne by Secretarial Office and Asset Type

Asset Type	No.	Replacement Plant Value[a] ($ millions)	Gross Floor Area (square feet)	Deferred Maintenance Cost ($ millions)	Deferred Maintenance ACI[b]	Deferred Maintenance Rating[c]	Rehab and Improvement Cost[d] ($ millions)	Summary Condition Index (SCI) Cost ($ millions)	Summary Condition Index (SCI) Index
SC Facilities									
Buildings									
Administrative/Office Use	10	122.1	621,641	2.4	0.98	Excellent	38.2	40.6	0.33
Medical, Cafeteria, Visitor, Computer	10	25.8	165,350	0.5	0.98	Excellent	5.7	6.2	0.24
Housing	9	26.6	182,769	1.3	0.95	Good	3.9	5.2	0.19
Storage	17	97.7	218,352	0.9	0.99	Excellent	4.3	5.2	0.05
Assembly	5	17.3	96,581	1.0	0.94	Adequate	11.3	12.3	0.71
Shops, Laundry, Calibration, Other Support	10	36.1	155,532	0.3	0.99	Excellent	3.0	3.3	0.09
Laboratories, Reactors, Accelerators[e]	37	764.5	3,044,402	27.7	0.96	Good	120.9	148.7	0.19
Other	0	0	0	0	0		0	0	0
Buildings, Totals[f]	99	1,090.0	4,484,627	34.2	0.97	Good	187.3	221.6	0.20
Other Structures and Facilities		244.8	0	15.2	0.94	Adequate	16.2	31.4	0.13
SC Facilities Total		1,334.9		49.4	0.96	Good	203.5	252.9	0.19
Non-SC Facilities									
Buildings									
New Brunswick Laboratory	1	23.5	85,372	0.3	0.99	Excellent	2.4	2.7	0.11
All Facilities									
Buildings									
Administrative/Office Use	10	122.1	621,641	2.4	0.98	Excellent	38.2	40.6	0.33
Medical, Cafeteria, Visitor, Computer	10	25.8	165,350	0.5	0.98	Excellent	5.7	6.2	0.24
Housing	9	26.6	182,769	1.3	0.95	Good	3.9	5.2	0.19
Storage	17	97.7	218,352	0.9	0.99	Excellent	4.3	5.2	0.05
Assembly	5	17.3	96,581	1.0	0.94	Adequate	11.3	12.3	0.71
Shops, Laundry, Calibration, Other Support	10	36.1	155,532	0.3	0.99	Excellent	3.0	3.3	0.09
Laboratories, Reactors, Accelerators	38	788.0	3,129,774	28.0	0.96	Good	123.4	151.4	0.19
Other	0	0	0	0	0		0	0	0
Buildings, Totals[f]	100	1,113.5	4,569,999	34.5	0.97	Good	189.8	224.3	0.22
Other Structures and Facilities		244.8	0	15.2	0.94	Adequate	16.2	31.4	0.21
All Facilities Total		1,358.3		49.7	0.96	Good	205.9	255.6	0.22

[a] Excludes reactors, accelerators, scientific equipment.

[b] Asset condition index. ACI = 1 – (DM/RPV), where DM is deferred maintenance and RPV is replacement plant value.

[c] Rating scale:

ACI Range	ACI Rating
1.00 ≥ 0.98	Excellent
0.98 ≥ 0.95	Good
0.95 ≥ 0.90	Adequate
0.90 ≥ 0.75	Fair
0.75 ≥	Poor

[d] Includes disposal costs for Buildings 040, 301, 325C, 330, and 374A.

[e] Excludes NBL, Building 350.

[f] Buildings 331 and 331A are counted as one FIMS building entry.

emergency preparedness are conducted under DOE procedures that are consistent with Argonne policies, though DOE retains lead responsibility for assurance and compliance. The NBL is a separate nuclear materials accountability entity; it is excluded from oversight, reporting, and control or security of nuclear materials, by or through Argonne.

In response to the RPAM order, DOE-SO and DOE-SC are negotiating the relationship regarding stewardship, property management, and recapitalization for the NBL. As reported through FIMS (see also Appendix G), the NBL facility requires substantial rehabilitation, though levels of deferred maintenance are "excellent" (1% of Replacement Plant Value). Future capital investment expected from DOE-SO is not included in this document.

4.3 Dispositioning and Long-Term Stewardship

4.3.1 Dispositioning

Five facilities, all radiologically contaminated, are presently listed as excess: Buildings 040, 301, 325C, 330, and 374A. Two of these — Buildings 325C and 374A — are waste storage facilities that are relatively uncomplicated to clean up and dispose of once operations are terminated and all stored materials have been removed. The types of former activities in Buildings 040, 301, and 330 and the shielding, heavy masonry, and construction types of the buildings will make their dispositioning more difficult technically and more costly, with longer project durations. Dispositioning of these buildings is summarized in Table 4.3.

The D&D and subsequent dispositioning of Building 40 and Building 374A are planned for funding through the Science Laboratories Infrastructure (SLI) Excess Facilities Disposition program in FY 2006. The D&D and dispositioning of Building 325C, the other waste storage facility, is planned for funding through the Excess Facilities Disposition program in FY 2005.

Building 301 is a remaining DOE-EM project (see Section 4.3.3). Disposal of the facility is expected to be funded through the DOE-EM program by FY 2007.

4.3.2 Long-Term Stewardship

The first component of long-term stewardship is the management of facilities after programmatic need for them ends, until their future use is eventually resolved. At Argonne, long-term stewardship involves initial characterization of a facility to identify hazards or remaining waste, then appropriate correction or remediation. Once the facility is in a stable, safe condition, a program of basic maintenance activities and inspections is established and conducted until final use or disposal of the facility is determined. Stewardship activities include maintenance of lighting, sprinkler systems, ventilation, and alarms, as well as regular walk-through inspections of systems. The principal purpose of the surveillance and maintenance program is to ensure that the real

TABLE 4.3 Radiologically Contaminated Excess Facilities

Building	Facility	Use	Year			Replacement Plant Value ($ thousands)	Area (thousands of gross square feet)
			Built	Status	Disposal		
40	Instrument calibration facility	Manufacturing and production	1949	2005	2006	1,657.8	4.896
374A	Lead mixed waste storage building	General storage	1969	2006	2006	28.5	1.651
330	Former CP-5 reactor	Multiprogram research (shut down pending disposal)	1953	2001	2008	21,455.4	52.743
301	Hot Cell D&D project	Physics laboratory (shut down pending D&D)	1950	2001	2007	14,475.0	29.845
325C	Waste building	Other storage	1966	2005	2005	163.9	0.700
	TOTAL					37,780.6	

property asset, including its systems and stored hazardous materials and waste, remains in a stable and known condition and that adequate protection is given to workers, the public, and the environment, pending disposition.

The second component of long-term stewardship is activities required to maintain systems established for remediation of radiologically and chemically contaminated areas. Argonne completed its environmental remediation program on September 30, 2003, under the corrective actions portion of the Resource Conservation and Recovery Act (RCRA) Part B Permit issued by the Illinois Environmental Protection Agency. However, seven areas could not be cleaned up sufficiently to be classified as available for free release. These areas are part of an Argonne long-term stewardship program that maintains the remediation systems and monitors groundwater to track residual contaminants. The scope of this activity is to provide ongoing monitoring, maintenance, inspections, and repairs to installed remediation systems. Included are the following:

- 317/319 area phytoremediation plantation
- 317/319 area groundwater extraction system
- 319 area landfill cap
- East-northeast landfill cap
- Groundwater management zone
- 800 area landfill cap
- Monitoring of seeps south of the 317/319 area

Because these activities are being conducted to demonstrate compliance with the RCRA Part B Permit conditions, including landfill closure, they are expected to continue for a minimum of 15 years. Annual operational funding is approximately $400,000, escalated at 3% (approximating the rate of projected inflation).

4.3.3 DOE-EM Facilities

Two facilities on the Argonne site are currently considered to be managed by DOE-EM, because their surveillance and maintenance activities are funded by DOE-EM specifically for the purpose of their decommissioning. The two facilities are as follows:

- Building 315 — Zero Power Reactor facilities
- Building 301 — Hot Cells

These facilities have all undergone extensive characterization, and reports have been issued for each.

A third facility, the Juggernaut Reactor, underwent decommissioning in FY 2004–FY 2005 under the DOE-EM Focus Program, and the space is being returned to programmatic work.

The Building 315 Zero Power Reactor facilities are the subject of environmental planning to support decommissioning in FY 2005–FY 2006 as DOE-EM funding becomes available. These facilities are also expected to be decommissioned under the DOE-EM Focus Program, with the areas being returned to programmatic use. Until decommissioning begins, appropriate surveillance and maintenance of the facility are maintaining its safety and readiness for decommissioning.

Building 301 is the largest remaining DOE-EM decommissioning project on the Argonne site, having awaited DOE-EM funding since completion of characterization. Appropriate surveillance and maintenance are keeping the facility safe and ready for decommissioning.

For one facility formerly funded for D&D by DOE-EM, Building 330 (CP-5), funding for disposal, currently estimated at $3.5 million, is planned through the SLI Excess Facilities Disposition program. Additional significant facilities requiring D&D and ultimately disposal include the M-Wing hot cells in Building 200 and the Alpha-Gamma Hot Cell Facility in Building 212 (if/when shutdown is determined to be the preferred course of action). Preliminary order-of-magnitude estimates for Building 200 total $63 million; comparable estimates for cleanup and disposal costs are not yet available for the Alpha-Gamma Hot Cell. Disposal of these facilities, when operations have ceased, will reduce general operating expenditures and eliminate significant continuing maintenance requirements. Disposal will eliminate this unused space, enhancing the Laboratory's performance in terms of the Asset Utilization Index.

5 Ten-Year Plan

The Office of Science has a goal of modernizing the infrastructure of its laboratories by FY 2016, in support of DOE missions. The Argonne *Ten-Year Site Plan* supports this DOE-SC goal. The overall aim of modernization is to achieve facilities and infrastructure that will be adequate to accommodate expected programmatic mission activities and technological changes well into the 21st century. To this end, Argonne has identified facility sustainment, recapitalization, and modernization needs and resource projections.

Argonne recognizes the gap between currently available resources and needs. The gap will continue to increase as budget constraints preclude or delay pursuit of planned sustainment, recapitalization, and modernization initiatives. To reverse the cycle of degradation of facilities, significant increases are required in funds for maintenance, recapitalization, and modernization of existing facilities. The plan presented here represents a balance between current facility needs and the known constraints of DOE funding, especially in planning period FY 2007–FY 2011.

5.1 Strategic Facilities and Infrastructure Goals

5.1.1 Vision

Argonne will retool its physical setting to achieve a 21st century infrastructure having appropriately configured research facilities that provide reliable, safe, efficient, attractive working environments suitable for world-class science, engineering, and technical services.

5.1.2 Goals

The following three major goals of this *Ten-Year Site Plan* support this vision:

- *Goal 1. Maintain Excellence in Environment, Safety, Security, and Health*

Argonne is fully committed to maintaining continued excellence in environment, safety, security, and health performance, both in existing operations and in the design, siting, construction, and operation of future facilities. This commitment includes compliance with applicable state and county regulations when they are not in conflict with DOE's policies and standards. Argonne actively complies with federal regulations in conducting project design, review, and construction, as well as in ongoing scientific and facilities operations. Complying with environment, safety, security, and health standards and increasing operational safety, security, and reliability are goals in rehabilitating and upgrading existing facilities. Argonne is committed to providing a safe, secure environment for all its employees and visitors. In addition, facilities, equipment, and information must be protected from theft, disruption, or misuse.

- *Goal 2. Continue Cost-Effective Use of Existing Facilities and Systems*

Argonne will continue to manage existing facilities and infrastructure to maximize the efficiency of mission research and support effort at the lowest effective facilities cost. Research and support space will be maintained to meet all functional, safety, and security requirements. As research requirements change, facilities and systems will be refurbished or upgraded, modernized accordingly, or assigned a new functional use. New missions will be accommodated by adapting or upgrading existing general-purpose facilities to meet mission needs wherever feasible.

Infrastructure management will focus on reducing the real unit cost of space through application of best practices in space management and allocation and in the maintenance and operation of facilities. Substandard, obsolete, or surplus facilities will be replaced or eliminated to reduce overall maintenance and operating costs and to free land for redevelopment.

- *Goal 3. Maintain and Enhance World-Class Setting*

World-class research is enhanced by world-class work settings, both within the actual workplace itself and in the natural

surroundings of the facilities in a campus setting. Modern, flexibly appointed research and support facilities will benefit from the latest construction technologies consistent with their research missions, as well as from flexibility, versatility, and longevity in design. Rehabilitation and construction will incorporate state-of-the-art sustainable-design principles regarding selection of building materials and furnishings, construction techniques, energy and water conservation, and habitability features, to the extent that such practices are economically feasible.

Natural areas will be maintained as a buffer and to provide expansion space. Standards for building intensity, coverage, and open space — comparable to existing conditions — will apply to all areas of the site. The existing site enhancement program will move forward in a manner consistent with the development standards.

5.2 Planning Assumptions

Achievement of Argonne's infrastructure goals depends on the following operational and mission-related assumptions for the ten-year planning horizon:

1. Operational funding is assumed to be stable, matching the rate of inflation for the conduct of scientific research programs.

2. Overall site population is assumed to remain roughly stable, as some research programs grow and others decline. Collaborating researchers from outside organizations will increase in numbers as the use of Argonne user facilities increases.

3. Research will continue to be diversified, in keeping with the role of a multiprogram laboratory. The types of research programs conducted at Argonne will continue to match the projected Laboratory missions for the planning period.

4. The way fundamental research activities are carried out at Argonne is changing. Integration between experiments and simulations will increase, as will collaboration by remote access.

5. Major new programs are expected to fund the construction of required special-purpose facilities, such as Center for Nanoscale Materials, the Theory and Computing Science Center, RIA, and the Illinois Science Center associated with RIA.

6. Infrastructure changes required to meet the changing needs of research within the existing facilities will be accommodated by laboratory space rehabilitation and modernization upgrades set forth in this plan, primarily via selective use of GPP funding for small-scale initiatives and also through use of limited line-item funding, consistent with DOE guidance.

7. Major new programmatic facilities are expected to fund all increases in capacity and demand required of the existing infrastructure. However, the existing infrastructure will be expected to deliver a fully functional interface point that minimizes the cost of construction.

8. All facilities, except those currently slated for demolition (as recorded in FIMS), are needed to support future research activities. Appendix F presents in greater detail the criticality of each facility and infrastructure system for accomplishment of DOE and Argonne research missions.

9. All construction and refurbishment will incorporate state-of-the-art sustainable design principles (e.g., regarding selection of building materials and furnishings, construction techniques, energy and water conservation, habitability features), to the extent that such practices are economically feasible.

10. Research will be accommodated, to the extent practical, on the Argonne property, minimizing the need for off-site leased space.

11. The configuration of refurbished or new laboratory space will meet the standards and needs of 21st century research, providing space that allows co-location of research, increased communications capability, higher-capacity utility services, and improved temperature and humidity controls. Modern laboratory appliances such as fume hoods, laboratory benches, and high bay capability will be provided for multipurpose use.

12. The use of third-party financing partnerships for the development of new facilities will continue to be a priority.

13. The Laboratory will continue to be a good neighbor to surrounding community stakeholders and will minimize the impact of construction and operations. Environmental compliance, with involvement of all stakeholders, will remain a priority. DuPage County's planned unit development standards that are applicable to office or research areas and light industrial areas will be a basis for future development.

5.3 Modernization — Future Trends and Their Impacts

Modernization of Argonne facilities and infrastructure will involve the upgrading of facilities that are "right-sized" to the type and quality of space and equipment needed to meet mission needs. Activities and organizations will be co-located as needed, and facilities will be made readily adaptable to changing research requirements and technologies. Off-site leased space is expected to be eliminated early in the planning horizon, pending funding of the Theory and Computing Science Center. The modernization plans will accomplish improvements in the following areas:

- *Working Environment*

Argonne will achieve a quality of facilities that provides a preferred working environment for researchers and helps attract and retain high-quality staff. The Laboratory will employ the latest advances in information technology to enhance worker productivity, interactions with other scientists, and scientific advancement. Quality training and conferencing facilities will be available. Visiting scientists will have access to quality accommodations and to research support facilities.

- *Environment, Safety, Security, and Health*

Argonne's facilities and infrastructure will provide a safe, healthy, secure working environment for employees and visitors. Retired facilities will be removed, and environmental cleanup will be completed. The Laboratory will be viewed in the surrounding community as a good neighbor.

- *Operations and Maintenance*

Facilities and infrastructure will be reliable and efficient to operate and maintain.

Future general-purpose infrastructure modernization requirements will be determined on the basis of the changing needs of Argonne's research. Infrastructure conditions need correction to improve the functionality of laboratory and support buildings. In addition, changing needs for modern laboratory configurations, collaborative research space, conditioned power supplies, and state-of-the-art communications capabilities must be addressed. These needs include competent interfacing of existing infrastructure systems with the needs of new initiatives.

Many aging research laboratories require electrical service upgrades to accommodate increasingly sophisticated instruments and computational capabilities. Modernizing aging offices is also increasingly important, because much research work is carried out efficiently in offices through automation and linking of facilities by computers. Appropriate modernization therefore includes improved lighting, energy-efficient windows, better electrical connections, high-speed Internet access, and modernization of telecommunications and information technology infrastructure, both to support internal communications and to facilitate collaboration with domestic and international partners. Some spaces can be used more efficiently for meetings and collaboration if they have open architectures.

Precise temperature, vibration, and humidity controls are crucial for much experimental research, including chemical and biochemical synthesis work, laser analysis, accelerator operation, and electron microscopy. The size of experimental samples has decreased dramatically in recent years, and the precision now available through microscale techniques generally requires a carefully controlled environment. Such work also often requires a cleaner environment, where particulate matter is filtered from the air and where modern hoods control emissions from hazardous materials such as solvents and carcinogens.

Modern laboratory space must be increasingly flexible and should include modular laboratory

benches that accommodate sophisticated equipment and are easily adapted to changing experimental needs. Synergistic collaborative research among traditional disciplines such as chemistry, biochemistry, and materials science benefits greatly from co-location in a flexible, modern research laboratory.

Modernization includes other important considerations. For example, all utilities (systems for data transmission, water, electricity, compressed gas, etc.) should be easy to install and remove. Long-term requirements for records handling and storage, library connections, and word processing must be accommodated. Additional open areas are required, as are more natural light, better (and larger) windows, and better surface treatments and finishes throughout the interior that are easy to clean and easy to repaint periodically or otherwise refurbish. Improved, affordable student housing is needed to encourage the best and the brightest to complete their research studies at the Laboratory.

Increasingly, research is performed from remote locations. Wireless data and voice connectivity is expected to grow exponentially in the next few years; connectivity with local, national, and international networks will become the norm in the foreseeable future.

Sitewide telecommunications are being upgraded to a state-of-the-art system to support 21st century research. To this end, the Laboratory has installed fiber optic cables between most of its major buildings. The network is continuing to grow, and use is increasing. Fiber optic facilities from major long distance carriers have been and are continuing to be installed to serve Argonne's increasing need to communicate data at high speeds with other educational and scientific institutions. The Laboratory also maintains national network connections such as ESnet (the DOE Energy Sciences Network) and MREN (a high-speed test network in the Chicago metropolitan area). These external networks interface with local Argonne networks and help to position the Laboratory as a major player in national and international networking initiatives. The Laboratory is installing a fully integrated voice-data-video-wireless sitewide communications system. This system would combine traditional PBX (private branch exchange) features with data switching capabilities, video teleconferencing, wireless capabilities for both voice and data, and communications via the Internet. The new system should be capable of supporting scientific program communications requirements for the next several years.

Increased DOE requirements for safeguarding of nuclear materials and security of personnel and physical assets affect infrastructure considerations with respect to custody of property, classified and unclassified cyber security, personnel security, information security, and physical site access controls. Argonne has a responsibility to provide a safe, secure environment for all employees and visitors. Facilities, equipment, and information must be protected from theft, disruption, and misuse.

Cradle-to-grave tracking and monitoring of high-risk property are major considerations associated with infrastructure needs. Access control points, the site perimeter, entrances, inspection points, communications systems, and other security-related infrastructure require significant replacement and rehabilitation.

5.3.1 Plan for Modernization

Achieving the Laboratory's strategic vision for the 21st century begins by eliminating deficiencies in existing facilities due to aging and obsolescence. Beyond restoring impaired functionality, the Laboratory must continue to improve building electrical and mechanical services; modernize the layouts and furnishings of laboratory spaces; enhance access controls, perimeter monitoring and surveillance, and security; and upgrade telecommunications. Maintaining and upgrading sound but depreciated facilities is central to Argonne's operating strategy for existing general-purpose facilities. Disposal or replacement of inefficient structures, continued environmental stewardship, and construction of new state-of-the-art programmatic research facilities complete the salient physical features of this *Ten-Year Site Plan*.

Argonne's planning for general-purpose infrastructure focuses on maintaining facilities that are safe, secure, and efficient, and, as required in a graded approach, on upgrading selected existing R&D facilities to 21st century standards and improving utilities and transportation networks.

A reliable, efficient, safe, secure, and environmentally sound state-of-the-art infrastructure will reduce operating costs and improve scientific productivity. To this end, this *Ten-Year Site Plan* describes planned infrastructure changes in three key areas: achieving scientific capabilities and initiatives through the addition of new facilities, addressing existing facilities' needs, and management of the site.

5.3.2 Proposed Programmatic Facilities Initiatives

In terms of overall plant investments and expenditures, the prime motivation for substantial modernization at Argonne is the attainment of state-of-the-art capabilities embodied in mission-driven new facilities, as identified in Chapter 2. Two of the more immediate initiatives, the Sub-Angstrom Microscopy and Microanalysis (SAMM) Laboratory and the final laboratory-office module (LOM 437) at the APS are entering construction under special GPP funding at the close of the current fiscal year.

The major large-capital programmatic initiatives and related capabilities include the following:

- *Center for Nanoscale Materials*

The Center for Nanoscale Materials (CNM) is a joint DOE-state of Illinois partnership under construction at the northwest sector of the APS. Prior facility use planning identified two research beamlines to be dedicated to nanoscale research; the CNM is co-located to take advantage of this technology. The CNM is a two-story structure similar to the APS in construction materials. It will include clean rooms, laboratories for chemical and physical measurements, computational laboratories, offices, and conference rooms. The total estimated cost of the project, $72 million, is split equally between DOE and state funding. The conventional facility is estimated at $36 million, provided by the Illinois Department of Commerce and Community Affairs. The balance of the funding supports a $36 million Major Item of Equipment project funded by DOE for the primary instruments and beamline construction. Facility construction began in FY 2004. Completion is projected in FY 2006.

- *Theory and Computing Sciences Center*

Designed to accommodate up to 550 occupants, the Theory and Computing Sciences Center building will provide a focal point for interdisciplinary research involving teraflops computer systems, large-scale computation and high-end visualization, theory, computing science, and experimental validation. The facility, to be located at Argonne's Cass Avenue entrance, is programmed to occupy up to 247,000 gross square feet. It will incorporate offices and laboratories, areas for collaboration and advanced digital conferencing, supercomputer support, and ancillary facilities. Innovative financing mechanisms are being examined to develop the facility for leasing by a third party, requiring a flexible approach to final space determination. DOE has accepted the mission need for this facility (Critical Decision 0) and is proceeding with the necessary approvals to begin implementation of a design-build, third-party-financed project.

- *Rare Isotope Accelerator Complex*

Argonne is one of several sites competing for RIA, a national mission to provide intense, high-quality beams of short-lived nuclear species for basic research in nuclear physics. Preconceptual work has outlined a building of 410,000 gross square feet, and site master planning currently locates the facility in the northwest quadrant of the 200 area, northwest of Building 203 and north of Buildings 208 and 206. Building components of this complex include the Illinois Science Center (see below), an accelerator operations building, a driver linac, a cryogenic facility, a high-energy experimental area, a production target area, a low-energy experimental area, and a new experimental area. Approximately 50,000 gross square feet of additional space has been identified for growth, to be designed in future phases to support the RIA science operations building and user expansion. Initiation of the RIA complex is pending DOE's siting decision.

- *Illinois Science Center*

The Illinois Science Center will be the first building of the RIA complex master plan to be built, following a favorable mission determination. The building mission is to accommodate and serve outside RIA users and related educational programs. The atrium building will contain approximately 71,500 gross square feet, including offices, laboratories, conference rooms, classrooms, an auditorium, and associated ancillary support spaces. The construction of the building will be funded by a $15 million state of Illinois grant, covering hard construction costs out to five feet from the building boundary. Costs for site utilities, paving and landscaping, parking, and work within existing connected buildings will be funded from other sources. This project has proceeded through final design under state funding. Upon successful selection of Argonne as the site for RIA, an aggressive construction schedule will begin.

5.3.3 Existing Facilities

The primary focus of building system upgrades and modernization is the older multi-program laboratory-office buildings in the 200 and 300 areas. Twelve buildings totaling over 2 million gross square feet (Buildings 200, 201, 202, 203, 205, 206, 208, 212, 221, 223, 360, and 362) account for the bulk of the modernization requirements.

Flexible common space will be provided to support increased, more effective collaborative research. The need is not just for a few conventional conference rooms, but also for areas of reconfigurable space where researchers can meet as needed and work together but still withdraw into individual work areas and laboratories nearby. Needs related to environment, safety, security, and health must also be main drivers determining work area configurations.

Increasing levels of automation for monitoring, operating, and maintaining building systems are needed. Automation will enhance the ability to control laboratory environments and energy supplies and will free staff from surveillance rounds for other maintenance tasks. Upgrades to sitewide communications and security systems must pervade the network of existing terminal stations, controls, and other building interfaces.

Flexible building infrastructure will support plug-and-play information hardware and facilitate incorporation of new hardware and technologies. In anticipation of wireless data transfer (even very locally), potential interferences from electrically noisy motors in heating, ventilation, and air conditioning (HVAC) systems and other building infrastructure will be minimized.

Argonne plans to implement its upgrade and modernization programs in rotating phases that concurrently address common system needs across several buildings. Building electrical systems will be upgraded for reliability and load capacity. Mechanical and control equipment and distribution systems will be improved to increase the flexibility and adaptability of the building utility support network. The final stage is to reconfigure, rehabilitate, and modernize space partitioning, laboratory furnishings, and architectural features. Argonne plans to implement modernization in wings or floors of buildings, so that entire buildings need not be shut down.

Energy conservation is one of the key strategies for reducing the cost of operations. Argonne will continue to use Energy Savings Performance Contract (ESPC) and Utility Energy Service Contract (UESC) mechanisms to reduce energy usage, improve systems performance and operations, and reduce costs. Though third-party financing is a component of the Laboratory's funding strategy, these funds are not included in the facility sustainment, recapitalization, and modernization projections and calculations described in more detail in Section 5.4.

5.3.4 The Site

The Argonne site (Figure 5.1) can physically accommodate a significantly higher level of development. Land use planning is described in Chapter 3. Environmentally sensitive and interconnecting open-space areas that support the natural ecology and hydrologic drainage of the site are being retained in their natural condition. The

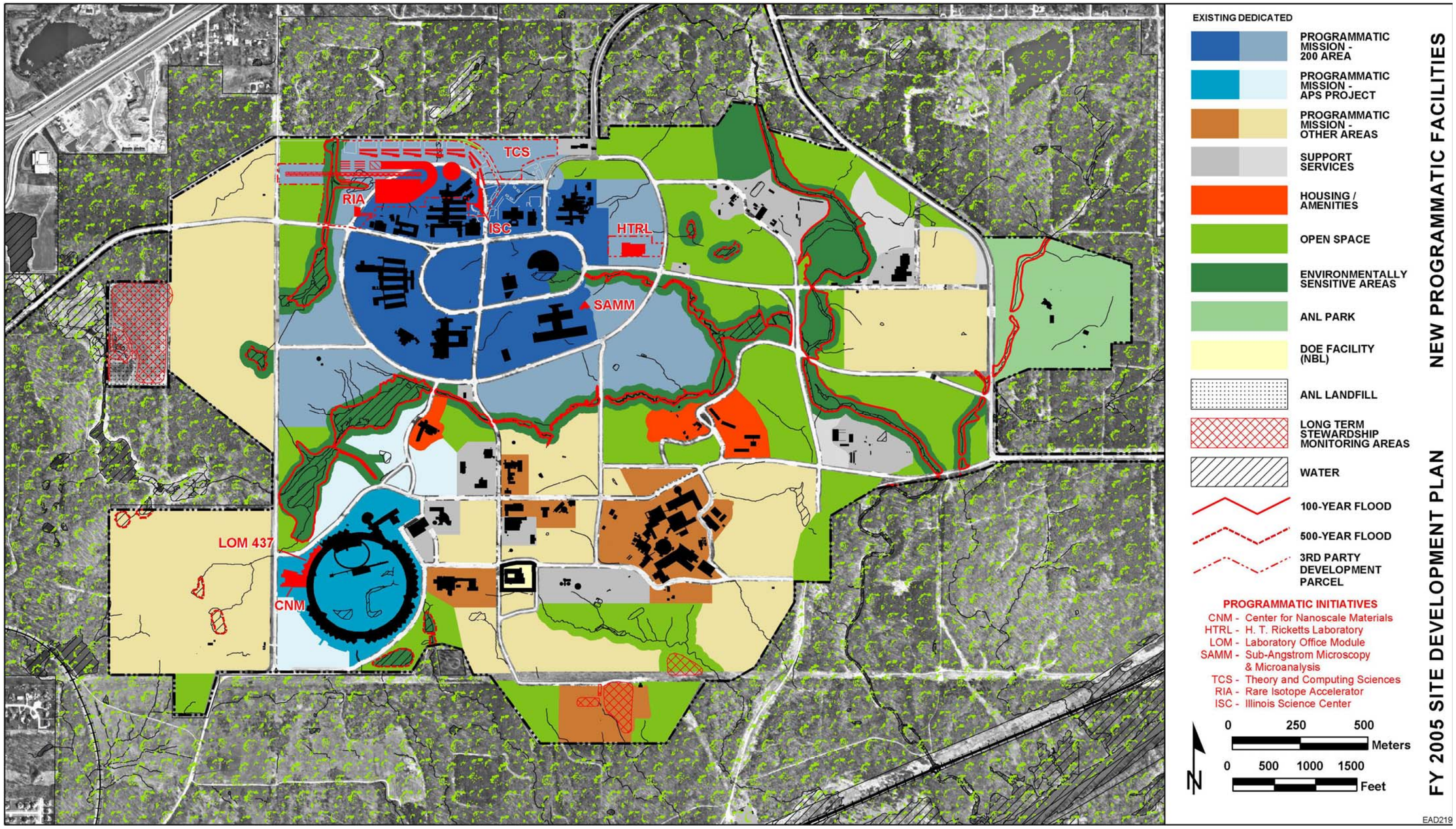

FIGURE 5.1 Locations of Proposed Programmatic Facilities Initiatives

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density of planned development on the balance of the site — in terms of covered area, floor area ratio, and landscaping standards — will remain consistent with the character of areas already developed.

The configuration of roads and the utility systems are adequate for future expansion. The general site circulation infrastructure (roads, walks, lighting, parking, perimeter controls, entrances, inspection facilities, traffic safety systems) and site utility systems will be rehabilitated to achieve reliability and extend service life.

Environmental monitoring and surveillance, including stewardship actions, are essential parts of the modernization plan. Included are surveillance and maintenance responsibilities that revert to the landlord upon completion of remediation funded by DOE-EM. Several of these remediation activities have arrested immediate health and environmental concerns; however, continued surveillance and maintenance of the remediated areas (described below) are required in accordance with the Laboratory's RCRA Part B permit.

Continued surveillance will be required for the remediated areas and former disposal sites, as well as for other sites that might be identified for further maintenance actions. Wetlands management and hydrologic characterization of the underlying groundwater are essential to maintain and monitor the natural environment surrounding the Laboratory. Studies of local groundwater flows and sound management practices for wetlands and deer habitat are needed to ensure that Argonne remains a good steward of the environment.

5.4 Resource Needs Summary

The resources identified in this plan are required to assure that Argonne's existing infrastructure will be maintained appropriately to promote operational safety, worker health, environmental protection and compliance, property preservation, and cost-effectiveness, while meeting program missions. This funding will provide a balanced approach that not only sustains the assets but also supports recapitalization and modernization.

Sustainment comprises the maintenance and repair activities required to keep the inventory of facilities in good working order. Sustainment includes regularly scheduled, periodic maintenance (routine operating maintenance) and major repairs or replacement of components over the expected service life of facilities.

Even with good maintenance, facilities and their subsystems eventually wear out or become obsolete and incapable of supporting mission needs. Such facilities are then replaced, recapitalized, or disposed of if they are not needed for identified continuing missions. *Recapitalization* extends the service life of facilities or restores lost service life; it consists of alterations and improvements to keep existing facilities modern and relevant in an environment of changing standards and missions.

Modernization creates new capabilities or enables new levels of performance at the Argonne site.

Sustainment, recapitalization, and modernization are interrelated. An effective sustainment program to protect facilities complements recapitalization investments, and neither modernization nor recapitalization can be effective in facilities that are not sustained. Facilities that are not sustained will rapidly become unreliable for exacting missions because of increasing levels of operational interference. Recapitalization and incremental improvement of existing infrastructure and support systems are also necessary for the updating and rejuvenation on which modernization depends and without which modernization cannot be successful.

Sustainment, recapitalization, and modernization requirements have been developed in support of the strategic plans and mission initiatives developed for Argonne in the context of DOE's overall strategic mission planning and planning guidance received from DOE-SC and the DOE Argonne Site Office, as well as other appropriate program guidance.

As Figure 5.2 shows, Argonne's needs to achieve its vision and meet strategic facilities and infrastructure goals for the ten-year planning horizon (FY 2007–FY 2016) total approximately $662 million for sustainment, recapitalization, and

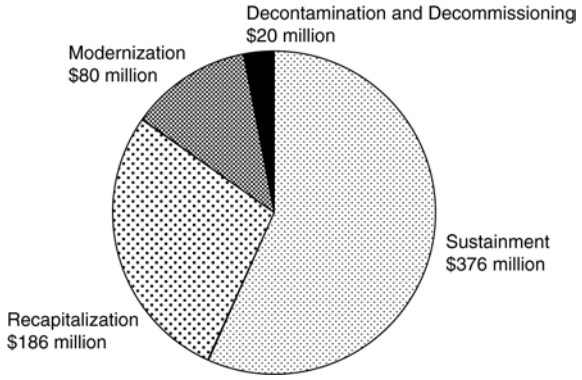

FIGURE 5.2 Resources Needed in FY 2007–FY 2016 to Meet Argonne's Facility Modernization Goals

modernization of active facilities and for decommissioning, decontamination, and disposal of contaminated or unneeded facilities.

The basis for these needs begins with provision for recurring annual maintenance (part of sustainment), estimated at $239 million. In addition, the known deficiencies associated with existing facility conditions — documented through the CAS process and reported in FIMS under Rehabilitation and Improvement Cost (RIC), Deferred Maintenance (DM), and Total Rehabilitation and Improvement Cost (TRIC) — amount to approximately $243 million. (These *itemized* needs are part of both sustainment and recapitalization.)

Also needed is provision for growth in deficiencies that is not identifiable under current CAS inspections but will result from either degradation or age-related decline in performance at the end of the life cycle. The growth in deficiencies is expected to accelerate (on a graded scale) during the later half of the ten-year planning horizon. This component is estimated at approximately $80 million (part of both sustainment and recapitalization).

The need for modernization, beyond recapitalization, includes increased emphasis on future issues such as flexibility and adaptability of general research space, as discussed in Section 5.3. The resource needs to address modernization are estimated at $80 million (approximately 30% of currently known deficiencies). This level of funding is believed sufficient to address modernization in selected major facilities designed to support future mission needs.

The final component of existing needs is for D&D and facility disposal, estimated at $20 million. These remediation activities will return contaminated space to future service or remove unneeded facilities from the inventory.

Accelerator improvement projects and acquisitions of scientific equipment are not included in the facility rehabilitation, sustainment, or modernization needs reported here.

The currently known deficiencies captured through the CAS in the TRIC and reported in the FIMS database do not reflect all of the needs described above. The Argonne CAS process has followed established procedures for identification and reporting of deficiencies However, under the new guidance, Argonne will address the incorporation of costs in future updates.

The funding profile to meet resource needs is based on planning guidance issued by DOE-SC and current Laboratory management plans. The guidance, though it enables Argonne to reach its goal by the end of the planning period, constrains the Laboratory from embarking on the road of modernization in the first five years of the planning period (FY 2007–FY 2011). During this period Argonne has been directed to assume level budgets for GPP funding and SLI Excess Facilities Disposition funding and to anticipate a new start for one SLI-funded line-item project, plus approximately $38 million in funding from the Deferred Maintenance Reduction (DMR) program. The second five years of the plan (FY 2012–FY 2016) are to include necessary funds for continued sustainment and recapitalization and major increases in funds to modernize the Laboratory, including D&D of excess facilities. Throughout the planning horizon, Argonne will achieve the 2% Maintenance Investment Index (MII) funding goal specified by DOE-SC and, in addition, is also committed to providing $2 million annually in Institutional General Plant Projects (IGPP) to meet facility needs. The proportions of required funds are illustrated in Figure 5.3.

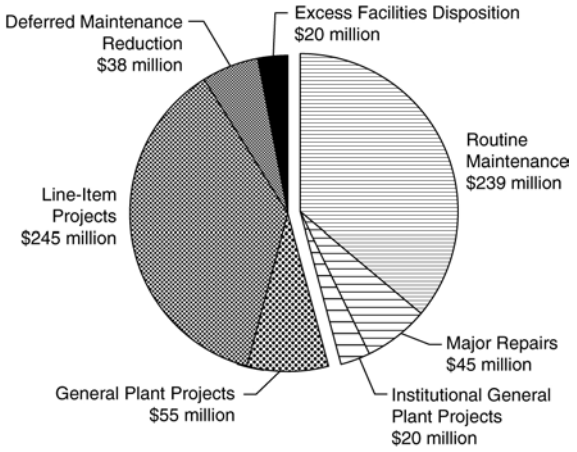

FIGURE 5.3 Funding Sources Needed in FY 2007–FY 2016 to Meet Argonne's Facility Modernization Goals

Table 5.1 summarizes the use of available resources to address sustainment, recapitalization, and modernization over the entire planning horizon. Third-party-financed improvements (ESPC and UESC projects) estimated to total approximately $10 million are not included in this table, which shows commitments from DOE and Argonne sources only.

The Integrated Facilities and Infrastructure (IFI) Crosscut (Appendix H) shows planned funding for FY 2007–FY 2016, on the basis of current guidance and funding assumptions. The specific FY 2007–FY 2011 Line-Item, GPP, IGPP and Major Repair projects shown in Appendix H are consistent with current environment, safety, security, health, and infrastructure (ESSH&I) prioritization.

5.4.1 Planning for FY 2007–FY 2011 (Five-Year Sustainment, Recapitalization, and Modernization Needs)

Argonne has developed a list of high-priority projects for the FY 2007–FY 2011 funding cycles by using a process of integration and prioritization of physical plant needs related to sustainment, recapitalization, and modernization. This list reflects the best assessment by Laboratory management and internal stakeholders of facility needs, prioritized with regard to ESSH&I risks.

In response to guidance from DOE-SC, the Laboratory has submitted one line-item project for funding during this planning period. The project was submitted for FY 2007 funding, as follows:

TABLE 5.1 Planned Funding ($ million) to Meet Facility Sustainment, Recapitalization, and Modernization Needs

	Laboratory Operating Funds[a]			Direct DOE Funding[b]				
	Routine Maint.	Major Repairs	IGPP	GPP	Line Item	DMR	Excess Facil.	Total
Sustainment	239	45	16	20	18	38	–	376
Recapitalization	–	–	4	15	167	–	–	186
Modernization	–	–	–	20	60	–	–	80
D&D	–	–	–	–	–	–	20	20
Total	239[c]	45	20	55	245	38	20	662

[a] Laboratory operating funds: routine maintenance, Major Repairs, and Institutional General Plant Projects.

[b] Direct DOE funding: General Plant Projects, Line Item Projects, Deferred Maintenance Reduction, Science Laboratories Infrastructure-Excess Facilities Disposition.

[c] This amount was shown as $155 million in the October 2004 Ten-Year Site Plan. The increase is attributable to improved capturing of actual maintenance expenditures.

- *Building Electrical Service Upgrades, Phase II — $17 Million*

  This project is the second phase of an initiative to upgrade critical portions of the building electrical power service in selected research buildings and support facilities in the 200 and 300 areas. The project's justification rests on an evaluation of the Laboratory's electrical power distribution system against several criteria. The overriding criteria are health and safety concerns and asset condition. This project will provide a renewed infrastructure segment, improving the safety, reliability, and proper functioning of facilities that support the Laboratory's research mission. The existing building electrical distribution systems are approximately 40–50 years old.

The Laboratory's needs for sustainment, capitalization, and modernization during this first five-year period total $415 million. In comparison, projected available funding of approximately $235 million is significantly constrained by DOE guidance limiting Argonne to, at most, one line-item project in the initial five years of the planning horizon. In addition, approximately $12 million is needed for D&D of facilities, compared to $4 million available from the SLI Excess Facilities Disposition program. The resultant deferral of $188 million of needed funding until the later half of the implementation plan will delay improvements required to increase the reliability, suitability, and cost-effectiveness of the physical plant. This funding delay is largely limited to consideration of line-item projects, for which 93% ($228 million) is not projected to be received until after FY 2011. Projected facility funding for FY 2007–FY 2011 is summarized in Table 5.2.

The Laboratory will use GPP funds for smaller-scale upgrades and modifications. These projects will modernize small areas in the buildings and will implement less extensive reconfigurations to complement larger-scale renovations. Such contingency usage of GPP funds will accelerate resolution of pressing needs for modernization. GPP funding will also support upgrades to portions of utility systems at selected locations.

Major Repair, IGPP, and DMR funds will address sustainment needs including reductions in deferred maintenance related to mechanical and HVAC systems, as well as repair or recapitalization of facility architectural elements, electrical systems, and other miscellaneous facility repairs.

TABLE 5.2 Projected Facility Funding ($ million) in FY 2007–FY 2011

	Laboratory Operating Funds[a]			Direct DOE Funding[b]				
Fiscal Year	Routine Maint.	Major Repairs	IGPP	GPP	Line Item	DMR	Excess Facili.	Total
2007	23.8	4.5	2.0	5.5	1.2	5.0	0.8	42.8
2008	23.8	4.5	2.0	5.5	8.2	8.0	0.8	52.8
2009	23.8	4.5	2.0	5.5	7.6	11.0	0.8	55.2
2010	23.8	4.5	2.0	5.5		15.0	0.8	51.6
2011	23.8	4.5	2.0	5.5			0.8	36.6
Total	119.0	22.5	10.0	27.5	17.0	39.0	4.0	239.0
Laboratory/DOE Summary								
Total		151.5			87.5			239.0
(Percent)		(63.4%)			(36.6%)			(100%)

[a] Laboratory operating funds: routine maintenance, Major Repairs, and Institutional General Plant Projects.

[b] Direct DOE funding: General Plant Projects, Line-Item Projects, Deferred Maintenance Reduction, Science Laboratories Infrastructure-Excess Facilities Disposition.

5.4.2 Planning for FY 2012–FY 2016

The planning scenario for FY 2012–FY 2016 is predicated on an aggressive funding schedule consistent with the modernization discussion in Section 5.3 and serves as a benchmark for charting the Laboratory's progress toward modernization. Under this funding scenario, Argonne will implement its modernization program within the planning horizon of FY 2016. The planning assumptions for this period are summarized in Table 5.3.

The line items identified for funding during the second half of the planning period represent preconceptual levels of need. Each project's overall level of need is keyed to an updated inventory of deficiencies and the revised strategy for incorporating increased funding from operational budgets, as required under the MII performance metric. The specifications for these projects will be replaced by detailed planning necessary to support the Critical Decision 0 review process during the later years of the plan. Project scopes will be developed consistent with funding profiles, specific mission needs, and facility conditions. These factors can, at best, be identified only generally four to five years before planned implementation. The SLI projects being considered for implementation during the second half of the planning period are as follows:

- *Laboratory/Office Space Upgrades — $78 Million*

This multiphased project will encompass essentially all aspects of modernizing laboratory space, including reconfiguration and upgrading of laboratory space envelopes, laboratory interiors, work area furnishings, communications, security, electrical distribution systems, plumbing systems, and laboratory and process piping. The project also addresses safety and health concerns by including upgrades of fume hoods, vacuum frame hoods, canopy hoods, and glove boxes, along with associated utilities. Phase I has been proposed for funding in FY 2012.

- *Roads/Parking/Lighting Upgrades — $35 Million*

This multiphased project will upgrade vehicular transportation and parking systems. The proposed work will include roadway and parking lot reconfiguration, modifications, and striping; storm sewer inlet upgrades; and curb work. In addition, existing street lighting will be replaced or added in vehicular operating areas. Phase I has been proposed for funding in FY 2013.

TABLE 5.3 Projected Facility Funding ($ million) in FY 2012–FY 2016

	Laboratory Operating Funds[a]			Direct DOE Funding[b]				
Fiscal Year	Routine Maint.	Major Repairs	IGPP	GPP	Line Item	DMR	Excess Facili.	Total
2012	23.8	4.5	2.0	5.5	2.4	0.0	3.2	41.4
2013	23.8	4.5	2.0	5.5	29.9	0.0	3.2	68.9
2014	23.8	4.5	2.0	5.5	43.3	0.0	3.2	82.3
2015	23.8	4.5	2.0	5.5	60.2	0.0	3.2	99.2
2016	23.8	4.5	2.0	5.5	92.2	0.0	3.2	131.2
Total	119.0	22.5	10.0	27.5	228.0	0.0	16.0	423.0
Laboratory/DOE Summary								
Total		151.5			271.5			423.0
(Percent)		(35.8%)			(64.2%)			(100%)

[a] Laboratory operating funds: routine maintenance, Major Repairs, and Institutional General Plant Projects.

[b] Direct DOE funding: General Plant Projects, Line-Item Projects, Deferred Maintenance Reduction, Science Laboratories Infrastructure-Excess Facilities Disposition.

- *Mechanical and Controls Systems Upgrades —- $45 Million*

This multiphased project will upgrade critical parts of mechanical and control systems. Included are rehabilitation and upgrading of HVAC, exhaust, and drainage systems and controls to address concerns such as reliability of operations and environmental protection. Phase I has been proposed for funding in FY 2013.

- *Building Electrical Service Upgrades — $25 Million*

This project will complete the final phases of the initiative to upgrade critical portions of the building electrical power service in research buildings and support facilities in the 200 and 300 areas. This project's justification is based on an evaluation of the Laboratory's electrical power distribution system against several criteria. The overriding criteria are health and safety concerns and asset condition. This project will provide a renewed infrastructure segment, improving the safety, reliability, and functioning of facilities to support Argonne's research mission. Many of the existing building electrical distribution systems are 40–50 years old. The next phase of this work has been proposed for funding in FY 2013.

- *Fire Safety Improvements – Phase V — $6 Million*

This project addresses remaining capital improvements needed for fire protection. Work includes correction of deficiencies affecting property protection and potential interruption of work, installation or upgrading of fire barriers, replacement of halo systems and obsolete building sprinkler water supply connections, and repair of hydraulically deficient sprinkler systems unrelated to life safety. This project has been proposed for funding in FY 2014.

- *Central Heating Plant Auxiliaries Upgrade — $14 Million*

The steam production auxiliary systems and components at the Central Heating Plant will be upgraded to improve the reliability and performance of the steam production process. The project will provide both energy and operational savings; it might be undertaken as an energy conservation project financed by a third party. This project has been proposed for funding in FY 2014.

- *Electrical System Upgrade — $19 Million*

This project will upgrade 5-kV and 13-kV overhead lines in the 200, 300, and 400 areas. The project will also replace 13.2-kV switchgear and interrupter switch lineups that serve the 300 area, increase the capacity of transformer T3, and replace transformer T6. Outdoor automatic transfer switches will be installed to serve Buildings 201 and 221. Most importantly, additional electrical service capacity will be brought to the site distribution system from Commonwealth Edison's supply grid, increasing reliability and service levels. The next phase of this work has been proposed for funding in FY 2015.

- *Building 362 Asbestos Abatement — $6 Million*

Asbestos-containing materials (ACMs) are present in many older buildings at Argonne. Damaged ACMs threaten building occupants and workers and must be repaired or removed; undamaged ACMs may be left undisturbed or sealed. This project will remove asbestos fireproofing materials now under floor decks and attached to steel structural elements in Building 362. The project will clean up friable asbestos. On a rotating basis, portions of each floor will be cordoned off, enclosed with containment measures, and remediated — including removal of ceiling tiles, where present, and installation of a new ceiling system. Occupants will be rotated from affected areas, and the buildings will remain in service. This project has been proposed for funding in FY 2015.

5.5 Management of Deferred Maintenance

Argonne has had an aggressive facility condition assessment and maintenance management operation for many years. (Also see Appendix J regarding maintenance of nuclear facilities and applicable DOE requirements.) Deferred maintenance is managed through the risk-based ESSH&I funding prioritization process

(described in Section 5.5.1) in use at Argonne over the last seven fiscal cycles.

To ensure consistency in reporting of deferred maintenance results, the following DOE definitions are used:

- *Maintenance* is defined as "the day-to-day work that is required to sustain property in a condition suitable for it to be used for its current designated purpose."
- *Deferred maintenance* is defined as "maintenance that was not performed when it should have been or was scheduled to be and which, therefore, is put off or delayed for a future period."
- *Improvements* are modifications "that increase the equipment capacity or functions or add something that does not currently exist."

Improvements are not included in deferred maintenance reported in FIMS. Deferred maintenance calculated through the end of the fiscal year does not include buildings, facilities, or other structures planned for demolition (i.e., declared surplus in FIMS).

5.5.1 Prioritization of Deferred Maintenance Needs

All identified facility needs are reviewed as part of the CAS process. Every identified deficiency is scored on the basis of the DOE Capital Asset Management Process (CAMP), which takes into account the impact of the facility need on health and safety, environment, safeguards and security, mission, and investment. Each CAS deficiency is reviewed at least annually to ensure closure of items that have been completed or are no longer needed. Need years and CAMP scores are examined at the same time to determine whether the urgency or priority of a project has increased, therefore prompting an increase in either CAMP or an earlier need year.

The most urgent maintenance needs are identified and remediated as they are recognized. The remaining maintenance needs that become the deferred maintenance backlog are therefore of lower priority and lower risk.

The ESSH&I evaluation of facilities needs is an ongoing process by which all identified needs are reviewed at least annually. The projects are prioritized by the ESSH&I stakeholders on the basis of the relative risks associated with the project, through use of the DOE CAMP methodology with adjustments based on stakeholder input.

Factors considered during this prioritization process include compliance with environmental regulations, responsiveness to public concerns, worker safety and health, public safety, asset preservation, plant reliability, support for programmatic initiatives, cost avoidance, and continuous improvement. Other factors taken into consideration could include the overall cost of the activities, precedence and coupling relationships among activities, and schedule considerations and other strategic or practical planning factors.

Funding allocations are based on stakeholder input and risk-based prioritization. As part of the prioritization process, a characterization of unfunded risk is prepared to ensure that Laboratory management and stakeholders recognize the risks related to underfunding or failure to fund all facility-related needs, including deferred maintenance needs. The FY 2004 Deferred Maintenance distribution by CAMP score is shown in Table 5.4.

TABLE 5.4 FY 2004 Deferred Maintenance Summary

CAMP Score	Deferred Maintenance ($ million)
Over 50	6.3
40–50	28.4
Below 40	15.0
Total	49.7

5.5.2 Plans for Reduction of Deferred Maintenance

Since the initiation of deferred maintenance reporting in 1998, total deferred maintenance at the Laboratory has steadily increased. This is due primarily to flat budgets, coupled with an aging physical plant. The result is an accelerating rate of increase in maintenance needs. Figure 5.4 shows

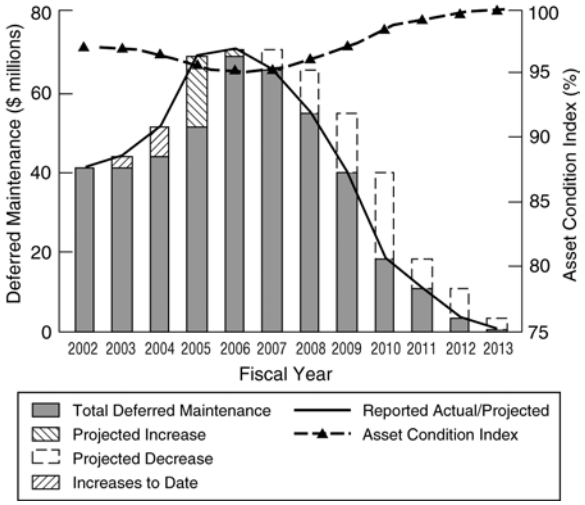

FIGURE 5.4 Deferred Maintenance Projections for FY 2002–FY 2013

reported and projected deferred maintenance from FY 2004 to the point where Argonne will be able to meet its goal of eliminating the deferred maintenance backlog by FY 2013. These projections are based on the commitment of Laboratory management to meet the MII target of 2% of plant replacement value and the funding requirements outlined in Section 5.4. The reductions shown are based on the assumption that routine maintenance, Major Repair and DMR funding supplements repairs accomplished under various IGPP, GPP, or line-item projects to meet annual needs. Where appropriate, demolition funds or funding related to energy management might also reduce the deferred maintenance backlog, though the sources are not included in the DMR calculations.

DOE-SC has established a goal of using a graded approach to achieve a condition of "good" or better (Facility Condition Index [FCI] of 5% or less) for all facilities identified as "mission critical" and a condition of "adequate" or better (FCI of 10% or less) for "mission dependent, not critical" facilities. A review of current facility conditions shows that a reduction of approximately $21 million in the Laboratory's current $49.7 million in deferred maintenance would bring the facilities to the graded-approach target levels. Table 5.5 identifies the facilities not presently meeting the graded expectations, ordered by descending required DMR values.

TABLE 5.5 Graded Approach for Meeting Deferred Maintenance Reduction Target

Facility	Required DMR ($ million)
Steam System	
108 Central Boiler House	3.5
531 Steam Distribution System	2.1
Subtotal	5.7
Key Multiprogram Laboratory/Office Facilities	
212 Energy Technology, Materials Science	3.3
205 Chemical Technology	2.8
202 Biosciences	1.4
362 Energy Systems, High Energy Physics, Energy Technology, Auditorium	1.2
Subtotal	8.6
Other	
515 Parking	2.8
14 facilities, each with $100 thousand < DMR < $1 million	4.1
16 facilities, each with DMR <$100 thousand	0.3
Subtotal	7.3
Total DMR required to meet graded-approach target	21.5

Throughout the planning period, but most significantly in the first five years, the limited funding will be applied most judiciously to achieve the greatest mission-related impact — on facilities critical to meeting programmatic missions and supporting the same missions. Items in the deferred maintenance backlog (1) having lower priority (CAMP rating less than 40) and (2) having slightly higher priority but not affecting mission-related facilities are not ideal candidates for preemptive application of scarce infrastructure funding, as the ultimate goal of total elimination of deferred maintenance would require.

5.6 Impact of Delayed Funding

The planning scenario described in Section 5.4 is based on Argonne's receipt of the resources required to achieve the goal of strategic facilities modernization in the FY 2007–FY 2016 time frame. Conversely, deviation from the planning scenario or deferral of funding will restrict the Laboratory's ability to achieve the modernization goals, allow continued degradation of the physical plant, and result in higher operating costs for repair and maintenance, inefficient or suboptimal

working conditions, and increased potential for major failures of antiquated systems. The necessity to reallocate significantly reduced resources to meet higher-priority needs for sustainment and recapitalization would delay the elimination of lower-priority deferred maintenance. Further, items designated for line-item funding as part of replacement or upgrades would be delayed, increasing deferred maintenance.

5.7 Facility and Infrastructure Issues

The D&D projects included in the DOE-EM baseline are expected to be funded by the DOE-EM program as discussed in Section 4.3.3. An issue related to D&D of active nuclear facilities may emerge in the future if Argonne cannot secure adequate funding to use its nuclear facilities effectively. Argonne maintains and operates many facilities, equipment, and experimental capabilities that are unique across the DOE complex and are critical to the nation's mission to develop sustainable nuclear energy technologies. These highly productive facilities are aging, and significant expenditures are needed for continued upgrades to optimize their operation and maintenance. The large-baseline nuclear programs that formerly carried these expenditures are being replaced with "smaller" science and technology projects, and the facility costs have become increasingly difficult to handle with research-derived operational funds.

Argonne is aggressively pursuing new directions for its nuclear research capabilities, including exploration for the new funding sources required to sustain these invaluable and unique capabilities and to retain their availability within the region. If the programmatic areas are successful in moving forward to secure new revenues, the continued operation of these facilities is not anticipated to become an issue. If continuing uses and adequate supporting funding are not identified, and if Argonne experiences a slow exit from nuclear experimentation, potential costs for remedying the legacy of closed or closing missions or placing these facilities in a safe, albeit unused, carrying mode will present a significant financial challenge that will require DOE support. In a similar situation in the 1990s, for example, the DOE-EM program was available to assist with mission transitioning throughout the DOE complex.

Appendix A:
Summary Overview of Argonne Facilities

TABLE A.1 Summary Overview of Argonne Facilities

	Office of Science (Argonne)	Office of Security (New Brunswick Laboratory)
Total building space	4,567,469 gross square feet (GSF)	85,372 GSF
Number of buildings	99 FIMS entries (100 actual buildings [331, 331A])	1
Largest occupied building	Building 400; 490,493 gross square feet	Same as above
Trailers (FY 2005)	11	None
Real property	None	Not applicable
Personal property (located on Illinois site)	11	Not applicable
Wooden buildings	4 (Buildings 320, 600, 604, 952)	None
Excess facilities (FY 2005):	10	None
Uncontaminated	5 (Buildings 300, 333, 604; Facilities 603, 607)	Not applicable
Contaminated	5 (Buildings 040, 301, 325C, 330, 374A)	Not applicable
Excess building space removed in FY 2004	5,629 GSF (Portions of Building 202 kennels in N and P Wings, Building 329, Building 317)	None
Replacement Plant Value (RPV — FY 2004)		
Total	$1,676.8 million	$24.5 million
Programmatic (other structures and facilities; 3000 category)	$326.9 million	None
Nonprogrammatic	$1,349.9 million (total adjusted)	Not applicable
Age of buildings (FY 2005)		
Average age	34.8 years	53 years
Space > 40 years	56.4%; 2.4 million GSF	100%
Space <=30 years	34.0%; 1.5 million GSF	0%
Maintenance Investment Index (MII) and maintenance funding		
FY 03	1.4% $17.2 million	1.0% $0.3 million
FY 04	1.7% $22.1 million	1.4% $0.3 million
FY 05 (projected, based on FY 2004 RPV)	2.0% $26.4 million	Included in SC
FY 06 (estimate, based on FY 2005 RPV)	2.0% $28.3 million	Included in SC
FY 07 (estimate, based on FY 2005 RPV)	2.0% $28.3 million	Included in SC
Deferred maintenance(DM) trend		
DM 2002	$40.2 million	$0.4 million
DM 2003	$42.5 million	$0.7 million
DM 2004	$49.7 million	$0.3 million
DM 2005 (estimate)	$67.1 million	Not applicable; included in SC
DM 2006 (estimate)	$68.8 million	Not applicable; included in SC
DM 2007 (estimate)	$63.9 million	
Total summary condition (DM + RIC) (excluding personal property trailers)	$245.6 million	$2.7 million
Deferred maintenance (DM)	$49.7 million	$0.3 million
Rehabilitation and improvement cost (RIC)	$195.1 million	$2.4 million
Total Summary Condition Index (TSCI)	18.1%	11.5%
Facility Condition Index (FCI)	3.7%	1.1%
Rehabilitation and Improvement Cost Index	14.5%	10.4%
ACI (Asset Condition Index) (1 – FCI)	96.3% (good)	98.8% (excellent)
AUI (Asset Utilization Index)	97.4% (good)	100.0% (excellent)
Leased assets		
Total (gross square feet)	92,773 GSF	None
Office	87,526 GSF	
Other	5,147 GSF	
Annual lease costs	$1.23 million	None

Appendix B:
Condition Assessment Process

The CAS inspections are an integral part of the Argonne management process, providing a credible, auditable basis for determining plant and infrastructure needs and documenting these needs. This inspection process has been carried out since 1993 by trained contracted inspectors with standardized skill and experience levels and third-party objectivity. The real property deficiency backlog database is the basis for evaluating individual facility conditions and for roll-up reporting via the FIMS database, the *Institutional Plan*, the *Ten-Year Site Plan*, and other management communications.

Stakeholder involvement is facilitated at Argonne through inclusion of building managers, maintenance personnel, and other representatives of each facility being surveyed in a given cycle. The CAS process is comprehensive, recording and evaluating unmet needs and projected plant requirements for a horizon up to ten years. The needs are sequenced in a preferred implementation order, so that maintenance and construction activities are considered along with the severity of the conditions to be corrected.

Argonne uses the CAMP method for prioritizing physical plant projects for funding consideration. An abbreviated form of this process is used to prioritize the corrective action recommendations from the annual CAS in the real property deficiency backlog database. Needs identified under this process thus receive a preliminary evaluation for funding, and they are scheduled within the database according to this priority. The Laboratory uses the facility information developed in the CAS to determine its level of deferred maintenance. These valuations are updated annually in the FIMS database.

Argonne performs a number of facility inspections every year (each with its own specific focus) to identify problems and deficiencies. These inspections include the semiannual environment, safety, and health inspections; environmental surveys; and various internal and external safety and environmental inspections. In addition, the Laboratory performs special-purpose inspections (such as the life safety and fire protection assessments and the asbestos surveys) as needed to address particular areas of concern. All facility deficiencies discovered through these inspections are documented as findings and recorded for tracking and resolution.

Each year, Argonne contracts with one or more outside firms to perform a CAS of its facilities, plant equipment, and site systems and utilities. The entire plant is surveyed to objectively measurable standards on a five-year cycle. The surveys result in detailed reports for each building, facility, or plant system. Building and equipment discrepancies identified by this survey are recorded in a real property deficiency backlog database. The Laboratory's CAS inspection system has been reviewed by cognizant DOE oversight groups and approved as an acceptable, site-specific implementation *in lieu* of the DOE-sponsored CAIS software system.

Argonne has no plans for substantially revising this process in the foreseeable future.

Appendix C:
Process for Development of the *Ten-Year Site Plan*

Argonne has a rigorous process for developing and reviewing this *Ten-Year Site Plan*. The development process was built on relationships established for development of Argonne's *Institutional Plan* and the ESSH&I prioritization and planning process. Mission needs identified through close programmatic collaboration with DOE Headquarters organizations and documented in the annual *Institutional Plan* form the scientific basis and core assumptions for all of these efforts.

The program visions and infrastructure needs, integrated with Argonne's mission as described in the *Institutional Plan* and *Business Plan*, are compiled as a strategic forward view from Argonne's programmatic managers. The program participants review and provide input into the resultant prioritization and coverage of the projects described, including overall recognition and understanding of changes needed and the appropriate areas of lead responsibility for the support divisions.

Programmatic input is further integrated into facilities and infrastructure planning through the ESSH&I prioritization and planning process. The activities and resources needed to accomplish the overall vision are evaluated and grouped into the types of facilities and activities they affect (site area, existing facilities, new facilities, and maintenance and operations activities) and the means of implementation (SLI, GPP, General Purpose Equipment, third-party financing, etc.).

Projects included in the *Ten-Year Site Plan* are ranked and selected for appropriateness in several interlocking processes. Most of the needs are evaluated on the basis of established CAMP criteria and the ESSH&I risk assessment. The scheduling reflects a broad consensus of operational and programmatic management and an integration of what is required to achieve the vision and initiatives identified by senior Laboratory management with regard to missions and infrastructure capabilities.

Argonne's management has approved this *Ten-Year Site Plan* to accomplish needed infrastructure investments in support of its research missions and scientific initiatives. This process has been coordinated closely with the DOE Argonne Site Office, whose staff have participated in the discussions and have provided input and feedback at the major junctures of the plan's development.

Appendix D: Detailed Site Conditions

This appendix contains detailed information about each of the facilities summarized in Chapter 4 of this document. These individual facilities and intermediate groupings by location or function directly affect Argonne's site infrastructure and its support of DOE research missions. The organization of this appendix is based on a functional subdivision of the site between the various developed areas, sitewide nonutility infrastructure, and the utility systems reported through FIMS.

Development of permanent facilities has largely adhered to the initial architectural site development planning of the late 1940s and early 1950s. The Inner Circle Drive and the Outer Circle Drive form a pattern that has been followed in most subsequent development. The first research buildings were constructed between the two roads. Early special-purpose nuclear facilities were located south of the two roads to provide meteorological advantage in the event of accidental releases. This precedent was followed in later development.

Most facilities are clustered the following ten distinct areas: east area, 100 area, 200 area, 300 area, 360 area, 400 area, 500 area, 600 area, 800 area, and Argonne Park (900 area). Detailed descriptions of each of these areas and the special concerns and opportunities associated with them are included in the sections below. General sitewide infrastructure (roads and bridges, parking, and pedestrian circulation and walks) and security-related assets (guard posts and fencing) are also discussed, as are several large utility facilities that are separate from the cluster areas.

Argonne allocates facility-related funding on the basis of its ESSH&I prioritization process by using the methodology described in Section 5.5 and Appendix B. Sitewide plans for elimination of the deferred maintenance backlog address all needs, prioritized on the basis of risk as evaluated by management. These plans are therefore not addressed specifically in the discussions of the site subareas and infrastructure systems.

D.1 Existing Developed Areas of the Site

The Argonne site (Figure D.1) has historically been developed as a series of related but spatially segregated functional groupings. This pattern began in 1948–1950 with the designation of the 800 area for contractor staging, the east area for initial administration and research, and the 200 area for long-term scientific research. Concurrent development of the 100 area for the centralized steam utility and the water processing and distribution center and the 500 area for wastewater processing continued the functional pattern of development. Later, special-purpose facilities were initially clustered along the Meridian Road-Rock Road-Bluff Road accesses (300 area), housing facilities were located in the 600 area, and the ZGS was constructed in the 360 area. The APS project and its supporting housing facility, both located in the 400 area, continued this pattern.

Each of the following sections describes a different portion of the existing site's development pattern. Each section describes the approximate extent of the site area, contains a brief summary of the historical pattern of development and its purpose today, and includes a map of that portion of the site. For each area, Table D.1 includes the gross floor area; current occupant count; and summary financial indicators based on replacement plant value (RPV), including total rehabilitation and improvement cost (TRIC), reported deferred maintenance (DM), the asset condition index (ACI), and the summary condition index (SCI). ACI is a decimal value based on the ratio of DM to RPV (1 – [DM/RPV]). The summary condition index equals the ratio of all known needs to the replacement plant value (TRIC/RPV).

D.1.1 East Area

The east area (Figure D.2) occupies approximately 113 acres immediately west of Cass Avenue and east of Sawmill Creek. Less than 10% of the east area is now developed, although it was

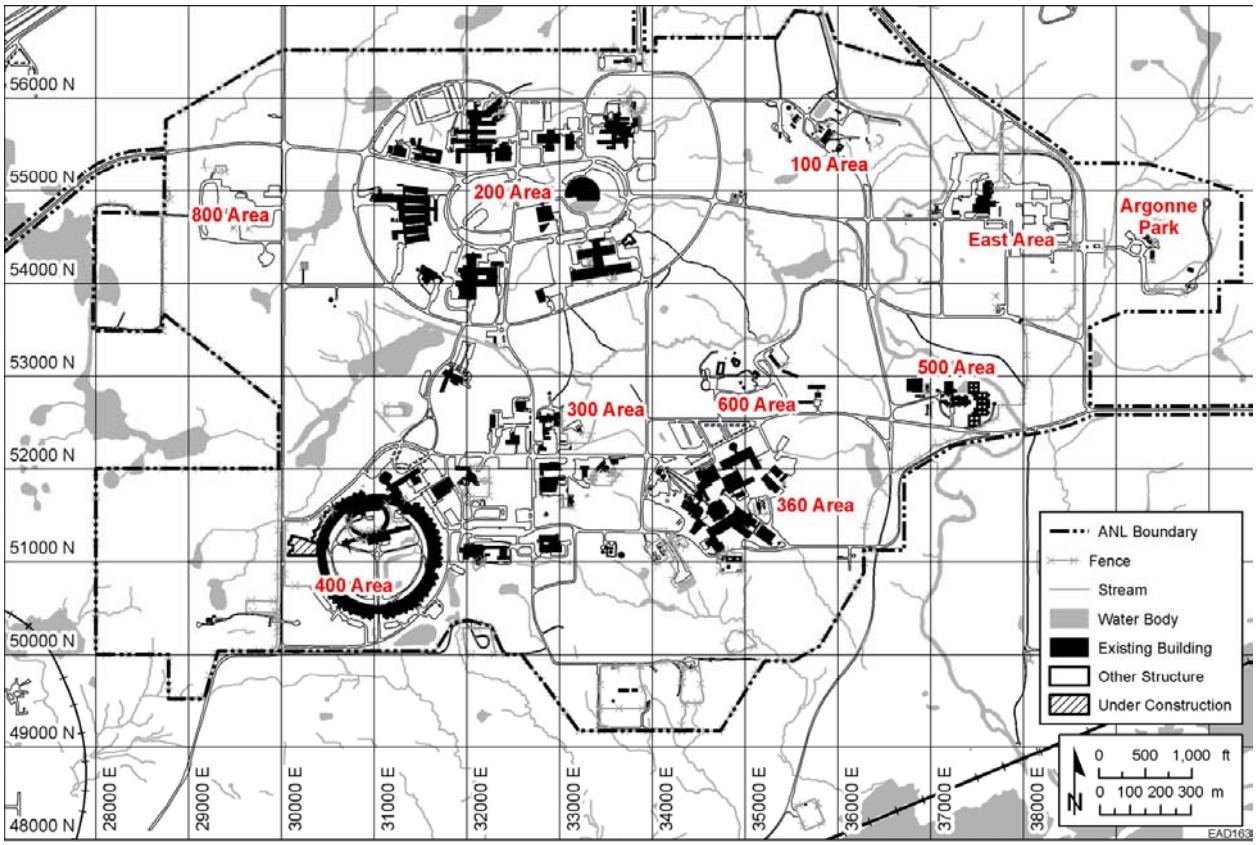

FIGURE D.1 Developed Areas of the Argonne-East Site

heavily developed from the late 1940s through the 1970s, with over 80% coverage of buildings, walks, parking lots, and roadways.

The east area once contained some of the oldest facilities on the Argonne site. Only Building 040 remains. The remainder of the original buildings erected in about 1950 for interim use during initial site development have been demolished.

Revitalization of the northern portion of the east area began with the Transportation and Grounds Facility, located north of the Eastwood Extension. As the original buildings were demolished, foundations were removed, utilities were capped, and the sites are graded and seeded with grass cover as interim landscaping. Most recently the Laboratory has turned to use of native plants to reestablish prairie habitat and reduce the need for mowing.

The predominant habitat type in the east area is old field, consisting primarily of nonnative grasses. Scattered areas of open oak woodland occur west of Tech Road. The riparian area along Sawmill Creek consists of intermittent open grassy areas and open woodland. A native tallgrass prairie is being restored on a six-acre plot in the far southeast portion of the area. Begun in 1997, the restoration will continue for several years. Future maintenance of the prairie will include scheduled burns.

The D&D and subsequent removal of Building 040, scheduled to begin in later in FY 2005, will complete removal of significant original buildings in the east area. This area is now a strategic reserve for large-scale missions, being well-suited for a graded level of security access, given the proximity to Cass Avenue and the large physical separation from the remaining developed areas of the site. Overall condition is adequate;

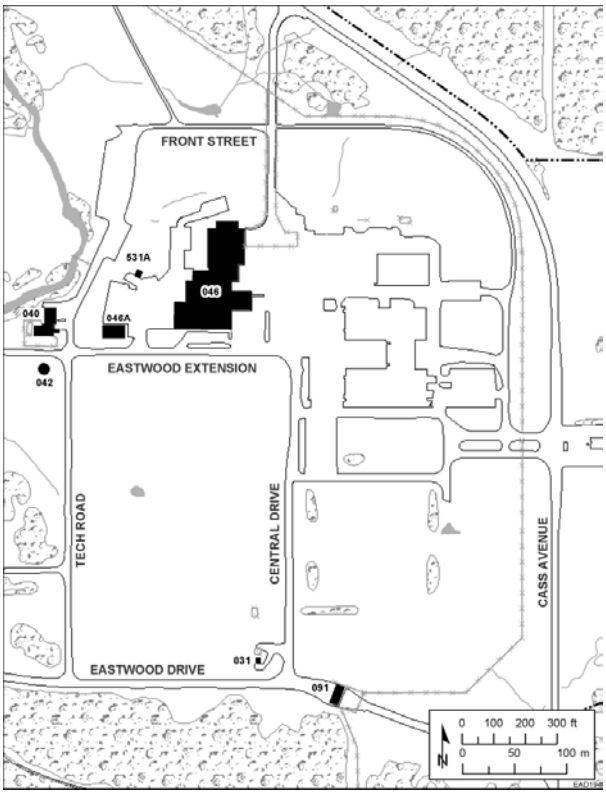

FIGURE D.2 The East Area

deferred maintenance is negligible, with a composite ACI of "excellent." Limited utility capacities and a lack of several specialized site-wide support utilities (chilled water, canal water, laboratory sewer), limited natural gas and steam, and significantly degraded roadways contribute to the need for recapitalization through new construction and mission-related redevelopment.

Because of the unique potential for graded security access offered by the east area's Cass Avenue frontage, Argonne has long planned for future development of a Technology Transfer Center or other unique facility there. The east area is also one of the potential future locations of site support service facilities, should future expansion be required.

D.1.2 100 Area (Central Heating Plant)

The 100 area (Figure D.3) includes the steam generation and domestic water treatment plants and various ancillary facilities, such as the coal

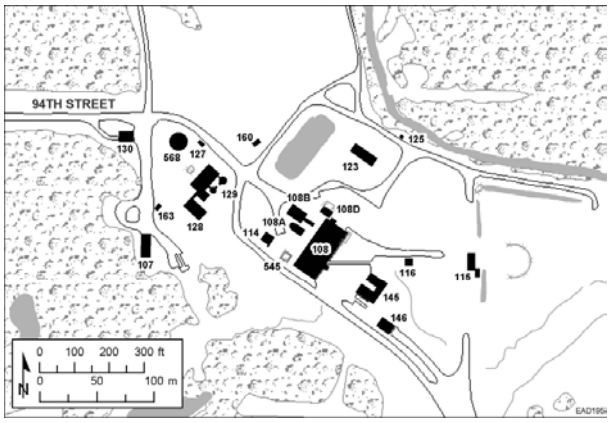

FIGURE D.3 The 100 Area (Central Heating Plant)

pile. Conditions at the steam generation facility are discussed in more functional detail in Section D.3.1. Use of Lake Michigan water is discussed in Section D.3.2.

Roughly 25% of the 62-acre 100 area has been developed to date. Most recently, the area has accommodated the site's control connection to the Lake Michigan water feed from the north corner of the east area. Shower and locker room facilities have been added in Building 123, which supports PFS Utility Service personnel. This area is bounded by Sawmill Creek to the east, Eastwood Extension to the south, the Argonne fence to the north, and the 200 area to the west.

Large areas of high-quality mature oak forest lie west and northwest of the 100 area; smaller areas of mature forest are to the northeast, across Sawmill Creek. A mosaic of pine forest, old field, and open woodland occur to the northeast and south. Open woodland is extensive within the riparian area along Sawmill Creek, while the floodplain consists primarily of old-field habitat.

The functionality of the 100 area is essentially steam production (Section D.3.1). Therefore, the overall physical condition of this area of the site closely follows that of the steam plant. As defined in the Condition Assessment survey (CAS) inspection process, facilities in this area are generally in need of significant rehabilitation, though the main boilers at the steam plant remain operational well beyond normal expected service life. The level of deferred maintenance is classified as "fair," primarily reflecting the

predominance of need in the central boiler plant. The condition of the roads is below the standard for the site in general because of the truck traffic for coal deliveries and the relative remoteness from the other developed areas of the site. The future operational configuration of the steam plant is under review to evaluate service options that might improve the cost performance of the operations. These operational considerations are addressed in the Section D.3 of this appendix.

Continued maintenance and upgrades of plant and equipment are scheduled for the 100 area. No immediate need for expansion of support facilities is foreseen at this time.

D.1.3 200 Area

The 200 area designation for the central area of major development of the Argonne site is derived from the numbering of facilities within the area from 200 to 291. The 200 area contains the largest concentration of present R&D activity and virtually all Argonne and DOE management activities. This has traditionally been the center of the permanent, multipurpose Laboratory effort in terms of floor area and number of personnel.

The 200 area (Figure D.4) comprises approximately 280 acres. About half of this land, around the center of the 200 area, has been developed; about 100 acres are reserved for future development. The 200 area is bounded by Freund Brook to the south, a tributary to Wards Creek to the west, the Argonne fence to the north, and the 100 area to the east.

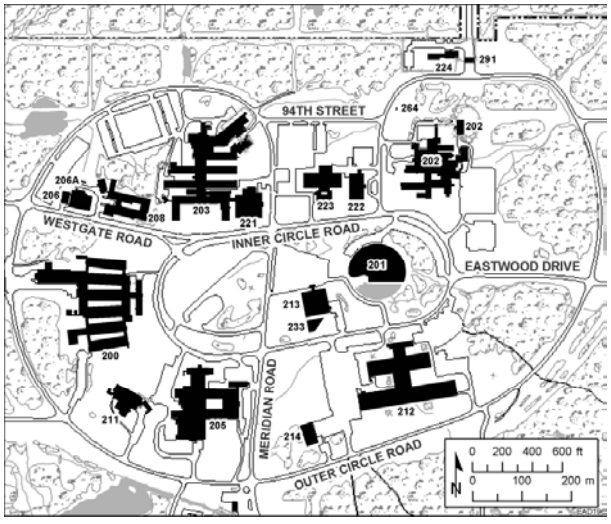

FIGURE D.4 The 200 Area

Most of the 15 permanent structures in the 200 area are research-oriented light laboratory and office buildings. They typically include a small auditorium or seminar room and other specialized support facilities, such as one or more shops for light work on machines, glass, and instruments. Expansion is also under consideration for the Rare Isotope Accelerator initiative, including the supporting Illinois Science Center. The 200 area is also identified for two additional initiatives: the Howard T. Ricketts Laboratory and the Theory and Computing Science Center, under third-party funding.

Most of the infrastructure (roads and utilities) and permanent buildings in the 200 area were constructed in the early 1950s and are approximately 50 years old. Many building systems have exceeded their design lives, although basic structures are generally in good to excellent condition. Ongoing and planned rehabilitation projects are addressing these issues. Some of the specialized scientific facilities may be reaching the end of their programmatic usefulness. Examples of conversion activities include the recent refurbishing/conversion of several wings in Building 202.

The primary vegetation type in the 200 area is mowed lawn. Open woodland occurs in scattered locations throughout the area, and mature deciduous forest occurs in the eastern portion of the area. Wetlands consist primarily of narrow drainages and roadside ditches; however, two large wetlands lie west and southwest of the Outer Circle Drive.

The presence of most of the original multipurpose scientific buildings in the 200 area dictates the area's overall condition: significant improvements and modernization are needed. Although the level of civil infrastructure is quite high, compared to other areas of the Laboratory, the need for building modernization, in addition to the incorporation of new missions and scientific initiatives described in Chapter 2, clearly establishes the 200 area as the predominant center of ongoing recapitalization. Deferred maintenance, notably the uniformly aging roofing systems, is

proportionately higher only in the 100 area and the 600 area. Nevertheless, given the scientific missions, the overall condition of the 200 area is rated adequate by the ACI measure.

The original site development concept for the central 200 area of laboratory and office buildings within the Outer Circle Drive remains sound. Some space is still available east of Building 202 for the addition of another facility. The area in the northwest section, near Building 203, has been cleared to facilitate a major expansion of the ATLAS user facility. Many of the 200 area core buildings are approximately 50 years old and thus need major rehabilitation to return them to state-of-the-art status. Rehabilitation and upgrades are already under way in several buildings, and proposals have been developed for meeting additional needs.

The space between Freund Brook and the Outer Circle Drive will be dedicated for future research and administrative (office) buildings. These will be multidisciplinary buildings that might be tied to operations in the present facilities.

The remaining space available east of Building 202, between the Outer Circle Drive and the Inner Circle Drive, will be used for a potential future multiprogram laboratory/office building complex. Small extensions or free-standing buildings associated with existing major buildings might also be added between the Outer Circle and the Inner Circle. However, care will be taken to ensure that adequate parking is available near the buildings and that the campus setting of the site is not jeopardized.

The 200 area office/laboratory facilities and support systems will continue to be rehabilitated and upgraded, with selective expansion to accommodate growth through multipurpose office/laboratory facilities. Redevelopment of the northwest portion of the 200 area is planned for the proposed Rare Isotope Accelerator (RIA) project and the Illinois Science Center, to be constructed with state of Illinois funding. Other programmatic expansion includes the Theory and Computing Science Center at the northern fringe of the site and the Howard T. Ricketts Laboratory east of Building 202. Additional programmatic growth and expansion of microscopy programs will occur in a new Sub-Angstrom Microscopy and Microanalysis (SAMM) laboratory adjacent to Building 212, entering construction at the end of FY 2005.

D.1.4 300 Area

The 300 area, located south of the 200 area, includes facilities numbered from 300 to 350 (Figure D.5). Most of these facilities were constructed in the early 1950s to house nuclear reactors and other special-purpose nuclear work. All of the older buildings have major heavy laboratory subfacilities. Most of these highly specialized subfacilities are underused because they are not suitable for present programs. This area is also the location of a recent facility renovation to accommodate growing programmatic initiatives related to homeland security.

Compared to other areas of the site, the 300 area contains a greater variety of geographies, running along Meridian Road south of Freund Brook and bounded by the APS (the 400 area) to

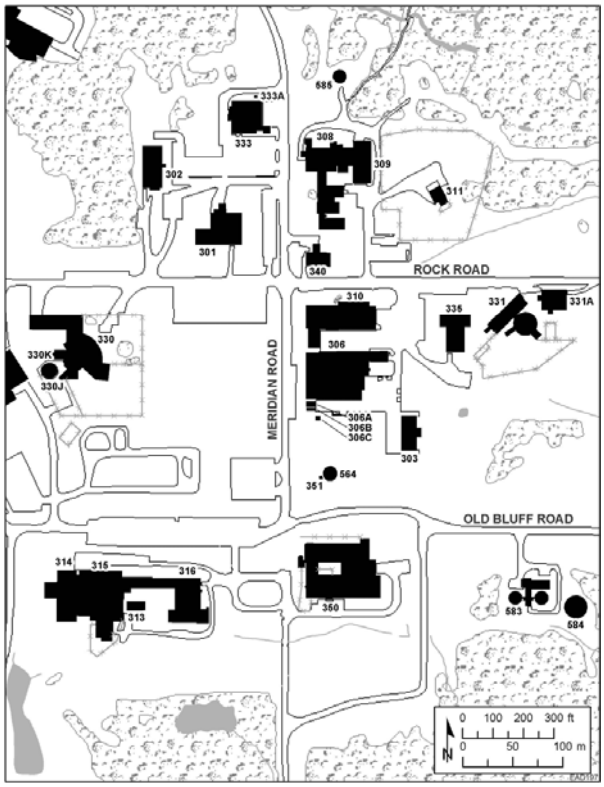

FIGURE D.5 The 300 Area

the west and by Southwood Drive and the 360 area to the east. The 300 area extends southward to the Argonne fence and includes approximately 180 acres, about 30% of which are developed.

The most recently constructed facilities in the 300 area are the Mixed Waste Storage Facility (Building 303), the Security Building (302), and the Fire Station (Building 333). Building 350 was remodeled, renovated, and expanded (with a major addition constructed in 1977) to accommodate the NBL, formerly located in New Jersey. Building 340 serves as the Argonne centralized mail distribution center and employee post office.

Almost all 300 area facilities are permanent structures. Because of age, most require rehabilitation or replacement of mechanical and electrical systems. These identified needs are being addressed as funding allows and priorities dictate.

A significant long-term issue is D&D of former nuclear facilities, support space, and associated process equipment beyond what has been funded by DOE-EM. Completion of these efforts, as well as other D&D projects, depends on proposed future funding from DOE-EM and identification of additional funding from other sources. A more complete description of planned D&D activities is Section 4.3. A second long-term issue is the low level of use for many of the other special-purpose facilities in the 300 area.

Like the 200 area, the 300 area contains several of the oldest scientific facilities on the site. Not surprisingly, the two areas are similar in terms of overall need. Unlike the 200 area however, several facilities in the 300 area are in immediate need of demolition. These are outdated special-purpose facilities that have exceeded both their mission functions and their design lives. Among these are (1) the former CP-5 Reactor (Building 330), recently returned to Argonne for disposal from the DOE-EM program; (2) the hot cells associated with the CP-5, Building 301, which is preparing to enter the DOE-EM cleanup process (see Section 4.3.3); and (3) several smaller waste storage facilities scheduled for disposition in the near future (Buildings 317, 325C, and 374A). Additional older facilities in need of major rehabilitation — in part because they cannot be replaced in the foreseeable future — include Building 306, Waste Management Operations; Building 309, Energy Technology; Buildings 310, 335, and 340; and Building 302, Security. The sole non-SC facility, the NBL (Building 350), is also located in the 300 area; it is in somewhat better condition than the area as a whole, though in need of some upgrades and recapitalization.

The 300 area also contains a significant proportion of older, inefficient roadways and parking areas that are not segregated from street traffic and are in need of both maintenance and modernization. Overall, the area is representative of its prevalent age and in need of major rehabilitation, though current levels of deferred maintenance are not problematic (ACI = 0.97), and the overall condition is classified as “good.”

Vegetation in the 300 area consists primarily of mowed grass and old field. High-quality mature oak forests occur to the northwest, south, and southeast, while a mosaic of pine forest, immature deciduous forest, and open woodland lies to the northeast and southeast. A rare, relatively undisturbed oak savanna is south of the Building 314/315/316 complex. Two large wetlands are located to the northwest, along the Freund Brook floodplain.

Ongoing rehabilitation and future D&D of contaminated areas, with removal of obsolete facilities, will continue in earnest. Disposition of Buildings 301 and 330 presents the greatest challenge in retaining Argonne’s high ratings for building utilization. Consolidation and elimination of unneeded waste storage facilities offer further potential operational savings as current inventories of stored materials are eliminated. Reprogramming of older special-purpose facilities for emerging missions presents the most favorable outlook for continued utilization of the assets in the 300 area.

D.1.5 360 Area

A large, high-energy (12.5-GeV) proton accelerator, the ZGS, was built in the early 1960s and operated from 1964 to 1979 in a complex, now known as the 360 area, comprising 30 distinct facilities that supported the accelerator and its research activities (Figure D.6). Building numbers in the ZGS complex range from 360 to 399. The developed complex includes 42 acres of the nearly 97-acre developmental potential. Two light

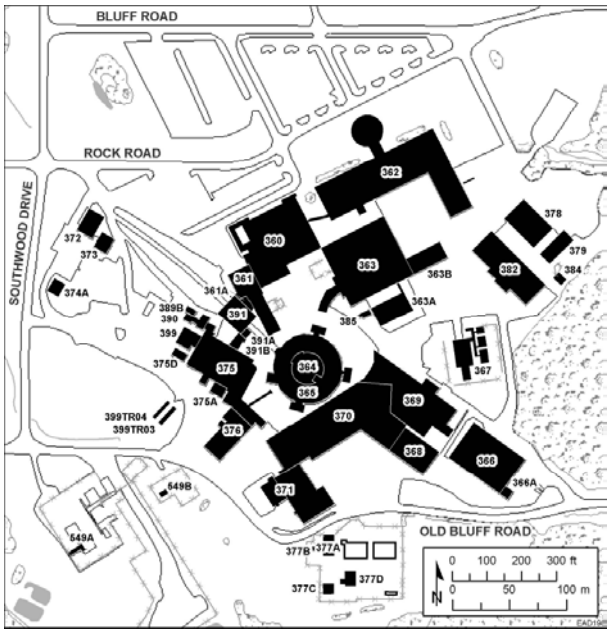

FIGURE D.6 The 360 Area

laboratory and office buildings, several specialized accelerator subsystem facilities, and numerous shop or heavy laboratory buildings provide the core for this specialized area.

The offices and light laboratories of Buildings 360 and 362 are used heavily. Some of the 360 area subsystems and facilities are used for the IPNS, a significant user facility. Argonne Central Shops, with stock and equipment, occupy Buildings 363 and 382. A modular facility, Building 363B, provides additional office space. Generally, the condition of facilities within the 360 area is good. However, most buildings are more than 30 years old, and as the buildings age, the need for rehabilitation increases.

The predominant vegetation near the 360 area buildings is old field, with mowed grass in the Bluff Road area. Extensive areas of high-quality mature oak forest lie to the east and south. These forests appear relatively undisturbed. They form a large contiguous tract and support a high diversity of species.

The 360 area benefits from somewhat newer conditions than the original areas of the site and consequently has fewer age-related needs. Buildings 360 and 362, the two major multi-program facilities that anchor the area, contain over 300,000 gross square feet (43% of the total) and are in need of substantial rehabilitation. Many of the associated buildings in the complex are large-span metal or metal frame buildings, frequently containing high bays, for which modernization costs are significant in proportion to the current value. These conditions are offset somewhat by recent significant improvements to the cooling facility (towers and chiller plant) and to many of the electrical service support functions in the 360 area that now contribute to the IPNS user facility.

The 360 area as a whole requires minor rehabilitation, including continued maintenance and recapitalization of the undifferentiated parking and circulation areas supporting the cluster of facilities congregated around the original accelerator ring building from the 1960s. Deferred maintenance, due in part to the recent upgrades of infrastructure and electrical systems, is somewhat lower than in the other main research areas (ACI = 0.92), for an overall rating of "good."

As with the 300 area, consolidation and elimination of unneeded waste storage facilities in the 360 area offers potential operational cost savings as current inventories of stored materials are eliminated. Reprogramming older facilities for emerging missions, and particularly reusing high bay capabilities, offers the most favorable outlook for continuation of the general purpose.

D.1.6 400 Area

The APS occupies over 100 acres of the 400 area in the southwest corner of the Argonne site (Figure D.7). The facility consists of a linear accelerator/booster synchrotron system that accelerates electrons to energies of 7 GeV or higher and a storage ring into which the electrons are injected. The electrons circulate around the ring, emitting beams of energetic synchrotron radiation or photons. These photon beams emerge from the ring along tangent lines for use in experiments housed in the seven modular user facilities along the circumference of the storage ring. Argonne is now constructing the Center for Nanoscale Materials (CNM) along several unused sectors on the west side of the ring, and an additional user module is planned for future

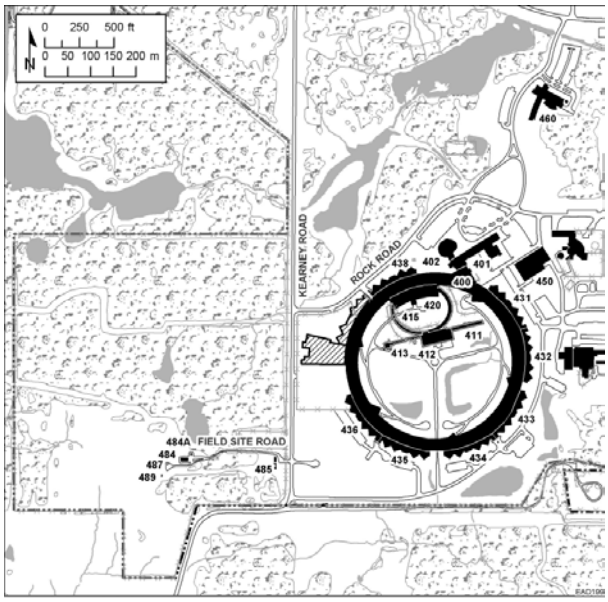

FIGURE D.7 The 400 Area

collaborative research. In addition to these experimental facilities, the 400 area also includes nearly 50 additional acres, with an expansion capacity of 32 acres and a 4-acre user residence facility, the Argonne Guest House (Building 460). The new permanent buildings in the 400 area began operation in 1996.

Other portions of this area, including Ecology Plot 1, are now used for several other small program activities. Present plans call for continued use of these areas.

The meteorology experimental area is in the southwest corner of the 400 area, west of the APS site. For almost 50 years, a cleared area has been dedicated to the investigation of an essentially undisturbed volume of the lower atmosphere. To preserve an unobstructed local wind flow, no major construction or tree planting has taken place in the area. A 197-ft-high meteorological tower is located west of Kearney Road. This tower is used to monitor wind conditions for sitewide emergency response. Two smaller towers are used for atmospheric physics and chemistry research and for monitoring deposition of atmospheric trace substances. Stations for two national monitoring networks are operated continuously at the site to provide baseline data for environmental assessments in the Midwest. Observations of local weather are also made available for routine and emergency use.

Although much of the 400 area consists of mowed grass and old-field habitat, high-quality native plant communities occur to the west and north. Mature oak forest is located west of Kearney Road and north of Rock Road. A relatively undisturbed tallgrass prairie (about 10 acres) west of Kearney Road represents the only intact prairie on the Argonne site. A smaller prairie (1 acre) nearby was part of a research program in the 1960s. Several relatively undisturbed high-quality wetlands occur west of Kearney Road. These wetlands support a high diversity of plant species, including several plant species not found in other Argonne wetlands. Two large wetlands occur to the north, and a wetland constructed in 1991 for mitigation of APS construction impacts lies to the southeast.

Ecology Plots 1 and 2 are west of the meteorology experimental area in the far southwest corner of the site. These plots are an on-site environmental research field station that supports several ongoing Argonne research programs. The plots provide a secure sample of a typical midwestern environment for ecological research. Although it is too small to be included in the DOE National Environmental Research Park system, the area is used in the same way, and scientists and students carry out many projects there.

The southern third of Ecology Plot 1 is used for dry deposition research. Most of the ecology plots have been left as undisturbed prairie or woodland to avoid interference with meteorological measurements.

The structures now located in the meteorology experimental area are Buildings 484 and 484A (the meteorological facility and associated storage building), Building 485 (the greenhouse, which is used periodically for ecology studies), and Facility 489 (the sitewide emergency response tower). Operation of the emergency response tower requires a minimum unobstructed area of 600 ft from the tower to provide representative wind conditions for sitewide emergencies. The present location of this facility is unique; it is the only area on-site with undisturbed near-ground airflow conditions to provide quality-controlled data.

As the newest area of the site, with all but 2,200 gross square feet built in the last decade, the APS is Argonne's infrastructure flagship. Deferred maintenance is virtually nonexistent, and the level of identified infrastructure need is less than 3% of RPV. Significant additions to vehicular parking are a need related to the success of the user facilities, and the recent addition to the central utilities plant, Building 450, is an additional indication of the facility's success and growth. Construction of the CNM is one of the key programmatic initiatives now under way, with state of Illinois funding providing the building infrastructure for the DOE-provided research equipment. Construction of the final element of the eight planned user laboratory-office modules on the perimeter of the storage ring, LOM 437, will also begin at the close of FY 2005. The challenge for the southwest portion of the site is to retain growth potential for additional utility services, along with a high degree of excellence in physical plant, as more pressing conditions in the remainder of the site demand resources for recapitalization. Increased central chilled water capacity is needed for planned expansion and to improve reliability. As the facility enters its second decade of service, early evidence of needs for age-related maintenance and growth-related upgrades is expected to appear, and levels of need are expected to grow accordingly.

The 400 area east of Kearney Road will remain dedicated to programmatic expansion of facilities closely related to the APS. West of Kearney Road, the land is being retained as an undeveloped land bank for large-scale missions that cannot be accommodated in the other programmatic research areas or in the brownfield areas of the site (east area and 800 area), where large-scale redevelopment is encouraged.

D.1.7 500 Area (Wastewater Treatment Area)

The facilities for treating sanitary sewage and laboratory drain water are located together on the southeast corner of the site (Figure D.8). The individual facilities and buildings are numbered in the 570 series if they serve the sanitary wastewater treatment process and in the 590 series if their functions pertain to the treatment of laboratory wastewater.

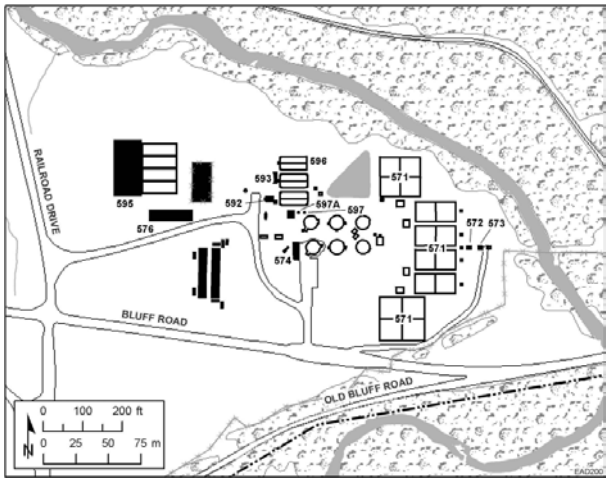

FIGURE D.8 The 500 Area (Waste Treatment)

The 500 area encompasses some 18+ acres east of Railroad Drive. The area is bounded by Sawmill Creek to the north and east and by the Argonne fence to the south. The area is presently 60% developed, with an expansion capacity of slightly more than 3 acres. Additional plant expansion would require removal of obsolete or unused filter beds and associated support structures.

The predominant vegetation of the 500 area is mowed grass and old-field habitat. The riparian area along Sawmill Creek supports an extensive scrub/shrub community. A large deciduous forest dominated primarily by mature oaks lies northeast of Sawmill Creek.

The Argonne wastewater treatment plants were significantly upgraded and recapitalized in the 1990s to meet higher required levels of service and to reduce effluent concentrations in conformance with more stringent standards. As a result, the overall condition of the area is adequate, with an ACI rating of "excellent" regarding deferred maintenance. As with the APS, as these facilities enter their second decade of operations, minor growth in needs and maintenance requirements is expected. No significant capacity expansions are planned, as the existing infrastructure can process considerable additional flow. Due for completion at the end of the current year is a feasibility study of recycling treated effluent from the laboratory and sanitary wastewater treatment plants as an alternative source for the canal water system feed. (See the discussion of the canal water system in Section D.3.5.) Current flow

is well below historical levels because of changing technologies and research and somewhat lower current and forecast site populations than in the past.

No additional development in the 500 area is foreseen at this time beyond the recent treatment upgrades described above. The area east of Railroad Drive and immediately west of the existing development is being held as a strategic reserve for additional plant capacity in the future.

D.1.8 600 Area (Lodging)

One of the parcels in the original Argonne site was the Freund estate, the country home of a private family. At the time of initial site development, about 1950, the only accommodations for visitors were in downtown Chicago, about 25 miles away. Consequently, the Freund residence (now Freund Lodge, Building 600) was converted to a guest house for visitors to the Laboratory. The facility provides meeting space and overnight accommodations for scientific and technical review committees and other business visitors and groups. The building also frequently serves as a site for high-level management meetings (Figure D.9).

The 600 area is adjacent to Freund Brook, which forms its northern boundary. The area is also bounded by Railroad Drive to the east, Bluff Road to the south, and Southwood Drive to the west. This area includes approximately 56 acres, 15 of which are presently developed. The remaining 41 acres are held as open space to enhance the environmental continuity of the central water course and to preserve aesthetic and recreational value.

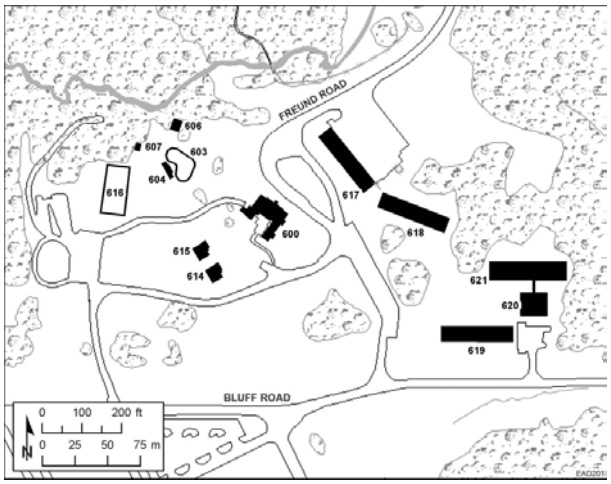

FIGURE D.9 The 600 Area (Lodging)

In 1952, two cottages (Buildings 614 and 615) were constructed to provide accommodations for families of scientists on lengthy visits to Argonne, such as university faculty members on sabbatical. In 1958, three motel-style lodging buildings (617, 618, and 619) were built to provide "collegial" accommodations for foreign students attending the International School of Nuclear Science and Engineering (ISNSE) at Argonne. In 1962, an additional lodging building (621) and a combined lounge-dormitory unit (620) were built to accommodate faculty members and students visiting Argonne to perform research at the ZGS.

Although the ISNSE ended in 1964 and ZGS operation ceased in 1979, other educational and scientific programs have generated a continuing need for lodging facilities. The newest of the 600 area buildings is 40 years old, and considerable regular maintenance is required. Significant mechanical rehabilitation is also required to improve the reliability of the various building systems. Since FY 1997, Sodexho Corporation has handled the daily operations and maintenance of the housing function, along with those of the Argonne Guest House (Building 460).

Extensive areas of open oak woodland and high-quality mature oak forest are the dominant vegetation of the 600 area. These forests appear relatively undisturbed. They form a large contiguous tract and support a high diversity of species. Large areas of immature deciduous forest lie to the west, north, and east. A large internal drainage area containing remnants of an open water pond system lies to the north along Freund Brook. These features were created by stone dams placed across the stream. A third dam was destroyed during a storm in 1996, and the associated wetland has subsequently reverted to upland.

The 600 area lodging facilities are evidencing their age more significantly than major scientific buildings of comparable vintage. Overall, this portion of the site is in need of significant major rehabilitation to the point of replacement, and levels of deferred maintenance approach 25% of

the theoretical replacement values of the assets (ACI = 0.78). Because these facilities are not constructed to a standard comparable to that of the research facilities, and because the tolerances to which they are required to perform are far less exacting, a *de facto* graded approach has long been used in reinvestment in and maintenance of the residential facilities and related amenities. Continued use of the area for housing out-of-town and foreign visitors and students is envisioned in support of several ongoing programs. However, the need for service reliability and increasing capabilities in the direct scientific infrastructure is unlikely to allow a significant change in management approach toward these facilities in the immediate future. The levels of deferred maintenance will be reduced as the Laboratory evaluates its risk-based allocation of funding and increases its commitment through the Maintenance Investment Index.

The housing functions of the 600 area are not expected to change. The area, including the recreational facilities, will be maintained as a site amenity. Relocation of the Argonne Exchange Club to this area has enhanced after-hours use of that facility. (Additional housing is also located north of the APS complex [Argonne Guest House] to accommodate APS users.)

D.1.9 800 Area

Facilities numbered in the 800 series were constructed near the site's west entrance in about 1950, as temporary storage and shop buildings, by the construction contractor for the initial Argonne site permanent construction. Demolition of the substandard 800 area facilities was completed in FY 1999, leaving in the 800 area only the security post at the Westgate entrance (Figure D.10).

A plot of about 25 acres just southwest of the 800 area buildings, used for landfill disposal of Argonne and DOE nontoxic solid wastes, was closed in FY 1993; monitoring of the landfill will continue. Nonhazardous wastes are now transported off-site for disposal under a separate contract. The 800 area contains large expanses of recently disturbed land and old-field habitat. A mosaic of pine, immature deciduous forest, and open woodland occurs to the north and south. A

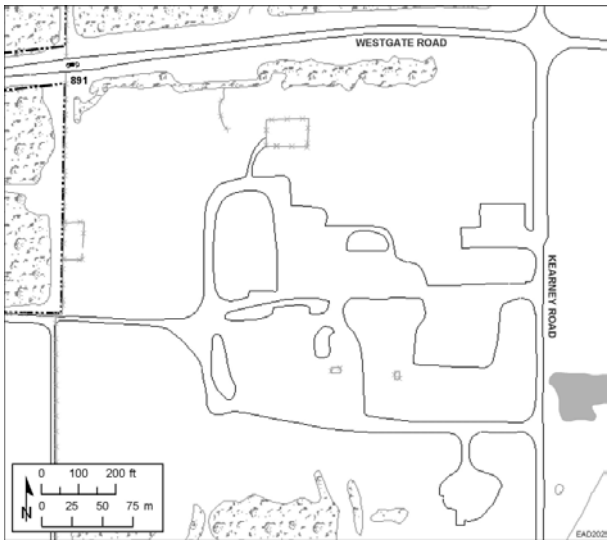

FIGURE D.10 The 800 Area

wetland area west of the Argonne landfill, part of a large marsh in Waterfall Glen Forest Preserve, forms the headwaters of Freund Brook.

The 800 area guard post, Facility 891, is in significant need of replacement to a more appropriate location, set back from the security perimeter, for better performance of its intended function and to improve vehicular flow as population growth has shifted to the west of the Laboratory. Because of the nature of this facility, deferred maintenance is not problematic, with an ACI rating of "excellent" (ACI = 0.98).

Clearing of the 800 area site has made it available as a clean parcel encompassing more than 51 acres. Landfill operations were discontinued on-site in 1992.

D.1.10 900 Area (Argonne Park)

A plot of some 53 acres east of Cass Avenue has been used for recreational activities since the Argonne site was first developed in 1950 (Figure D.11). The park setting and ready public access from Cass Avenue also provide an appropriate setting for the Argonne Child Development Center, which accommodates a preschool program (operated under contract) for approximately 75 children or dependents of Argonne and DOE employees. Warm-season use

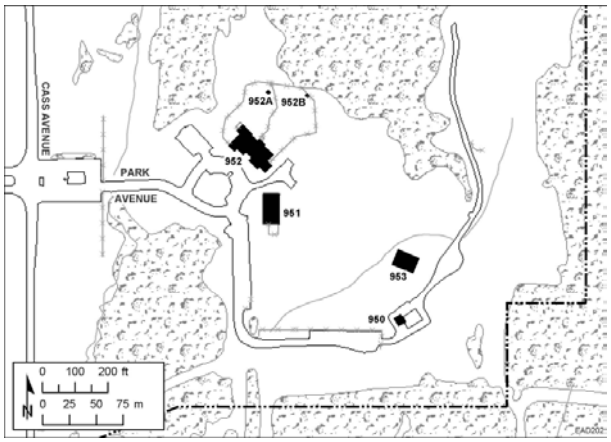

FIGURE D.11 900 Area (Argonne Park)

of the facilities and year-round use of the club building are high. Since 1993, the Darien Park District has used the park for recreational activities through a shared-use agreement with DOE's Argonne Site Office.

Much of the Argonne Park area consists of mowed grass and old-field habitat. Pine forests occur to the west and south. The mature oak forest along the north and east is part of a larger forest in Waterfall Glen Forest Preserve. A large area of open woodland, including many mature oak trees, composes the north-central portion of the park.

The northern, southern, and eastern boundaries of the park abut DuPage County Forest Preserve land (transferred from federal ownership in the mid 1970s). The narrow strip of forest preserve land on the eastern boundary separates Argonne Park from several privately owned apartment complexes. Despite its narrow width, the lightly developed character of the park serves an important purpose as an ecological bridge for the wildlife and plant communities of the forest preserve.

Conditions at Argonne Park are bimodal. The older facilities, including the restrooms and the recreation center, are in need of significant age-related recapitalization and improvements, though the levels of deferred maintenance are acceptable. The newer facilities are in good condition and have little deferred maintenance. As with the 600 area, this area is not driven by scientific performance parameters, although the Child Development Center is required to meet high standards of operation and is continuously monitored under state of Illinois requirements and other reviews. Overall, the Argonne Park is in need of minor rehabilitation, primarily focused on the two older structures, and is rated as "excellent" (ACI = 0.99) regarding deferred maintenance.

No significant land use changes are currently planned for the Argonne Park.

D.1.11 Miscellaneous Facilities

Numerous utility structures are located throughout the site, either among the developed functional areas or as isolated improvements away from other structures. Utilities are discussed in general functional terms in Section D.3.

D.1.12 Trailers

Argonne relies on very limited numbers of trailers and modular storage containers to meet short-term fluctuations in demand for facilities. In the 1980s, the use of trailers plummeted as facilities in the older east and 800 areas were replaced by newer facilities in the 200 and 300 areas. In the early 1990s, as many as 86 trailers and storage containers, amounting to more than 61,350 square feet of enclosed space, were being used. Leased office trailers have now been eliminated. Modular storage containers amount to no more than 19,000 square feet of unconditioned storage.

D.2 Sitewide Infrastructure

D.2.1 Civil Infrastructure (Vehicular and Pedestrian Circulation)

This section discusses site civil improvements, especially transportation systems. The site's ground transportation system provides the linkages between all of the developed areas and permits convenient, unobstructed circulation within each of these areas (Figure D.12).

Transportation improvements include roadways and bridges, parking and vehicular loading areas, and pedestrian circulation, including sidewalks and trails. Approximately 28 miles of

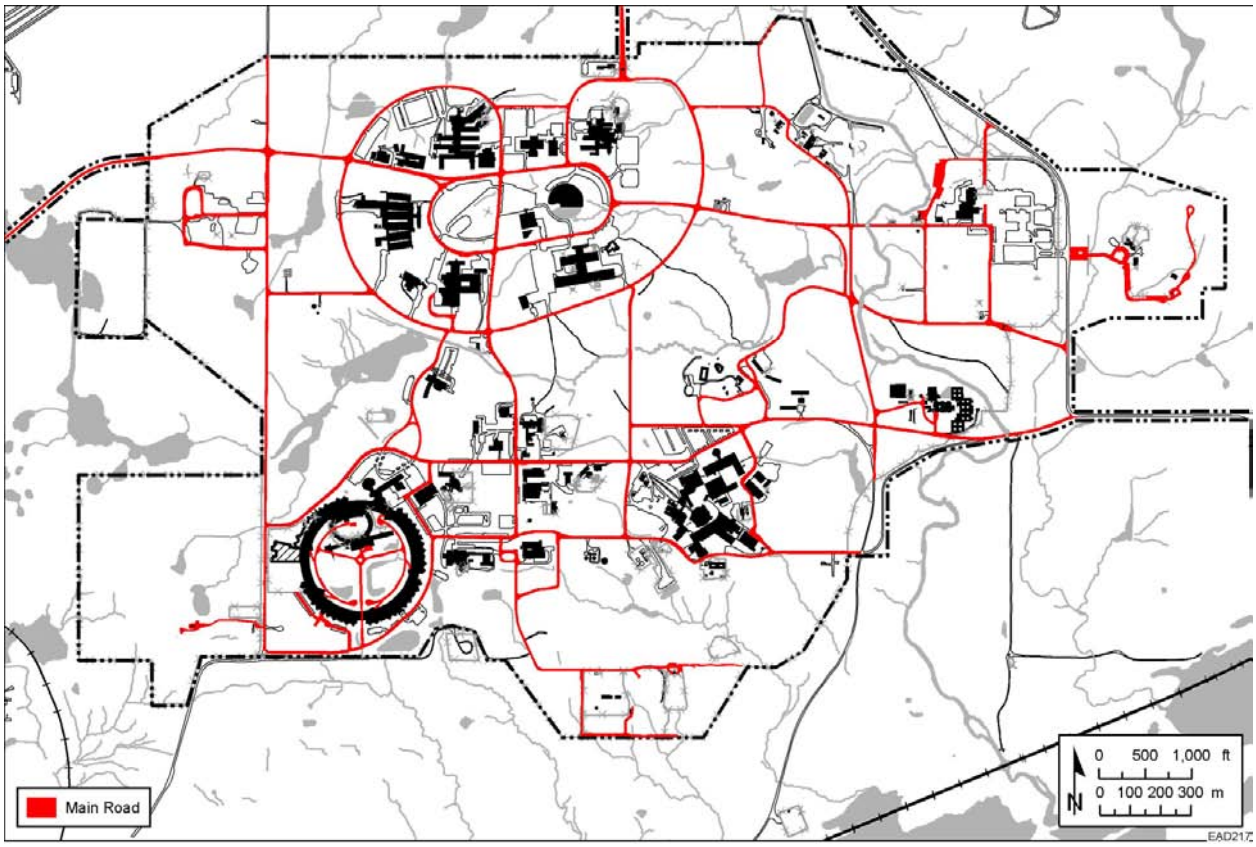

FIGURE D.12 Road System

roadway exist at Argonne, including the access roads to Cass Avenue and Lemont Road. Approximately 4.5 miles are unpaved; an additional 2 miles of roadway are maintained by DuPage County along Cass Avenue and Bluff Road. These roads serve unrestricted local traffic as part of the general county road system connecting to I-55 and Illinois Route 83.

D.2.1.1 Site Vehicular Circulation — Roadways and Bridges

Most on-site travel is by private motor car. Within each area, employees generally walk between buildings. A few individuals bicycle to work and between buildings, but the routine use of bicycles on-site is rare, largely because of the often severe winter weather and frequent spring and fall rains. In pleasant weather, many employees in the 300 and 360 areas walk to and from the cafeteria (Building 213) for lunch. However, little work-related pedestrian travel occurs between areas, because walking time is excessive. Employees routinely use private cars for work-related trips between areas.

Vehicle circulation is controlled by the existing road configuration. Road use during most of the day differs from that at 7:00–9:00 a.m. and 4:00–6:30 p.m., when employees arrive or depart. The main (north) gate is open 24 hours a day, 365 days a year. The west gate is open Monday through Friday from 6:30 a.m. to 7:00 p.m. The east gate opens between 7:00 a.m. and 9:00 a.m. and between 4:30 p.m. and 6:00 p.m. to improve traffic flow during the concentrated arrival and departure of employee vehicles.

Construction, sales, and delivery people, as well as non-U.S. citizens, must obtain a pass at the Argonne Information Center (formerly the Visitor Reception Center) in Building 224. Passes are valid at any open gate, but most visitors enter at Post 291, on Northgate Road, because of its proximity to the Argonne Information Center.

Public transportation is available at the Northgate Road entrance, with scheduled bus service in the morning and late afternoon. This route connects with the Metra train stations in Westmont and Glen Ellyn.

While some employees travel to Argonne via alternative methods of transportation, most travel by private car. Laboratory efforts to promote car pooling and unsubsidized bus and van travel have had little effect on transportation patterns in the past.

Both limited availability of public transportation options and immediate access to expressway interchanges and the road system in the Chicago suburban area contribute to employees' preference for personal auto commuting. This preference also has enabled a wide geographic distribution of employees' residences, because travel is relatively easy.

D.2.1.2 Truck Traffic

Many truck deliveries are made directly to the Central Supply Facility dock at Building 046. Fenced direct access to Cass Avenue segregates truck deliveries and shipping/receiving capabilities. The deliveries do not contribute significantly to on-site traffic. Other on-site truck traffic is so light that minor problems occur only occasionally at entrance gates, though rerouting of errant trucks is problematic because the limited room to maneuver at the gates.

D.2.1.3 Traffic Volume

According to Illinois Department of Transportation standards, vehicle accumulation at intersections and gates is minor, even during rush hours. On-site vehicle accidents resulting in significant personal injury have been extremely rare. Argonne maintains a traffic control light outside the west gate (at Lemont Road). Development along the frontage road south of I-55 has increased the use of Westgate Road at Lemont Road. This location is an area of increasing concern. It has been the subject of several traffic studies and is the subject of a proposed intersection redesign. Increasing employee residence in the expanding suburbs to the west has significantly increased the traffic load at the west gate during normal rush hours, necessitating redesign of the existing guard post to handle increased traffic flows and revised security procedures to move vehicles safely and without substantial queuing.

Future circulation patterns on the site are not anticipated to change drastically. Relocation of off-site personnel from Building 900 to the site will increase intra-site trips by roughly 5%, contributing to increased traffic congestion during the morning and evening peak hours. Projected near-term intra-site traffic patterns will be evaluated, and their effects on existing vehicular and pedestrian circulation will be analyzed.

With the planned introduction of several scientific initiatives in the 200 area and the relocation of the Building 900 population, congestion during the morning and afternoon rush periods will increase. This may necessitate restructuring the main entry traffic pattern serving new initiatives such as the Theory and Computing Service Center, the Howard T. Ricketts Laboratory, RIA, and the Illinois Science Center. Lines of vehicles exceeding 0.5 mile in length occur at both exit gates during the afternoon rush. The proximity of the west entrance to the I-55 interchange on Lemont Road creates a problem for southbound employees turning left into the site; this problem is aggravated by the necessity, for vehicles exiting I-55, of merging into stopped traffic across two lanes of moving vehicles on Lemont Road. Entering/exiting traffic control has consequently become an issue during peak usage at on-site intersections.

D.2.1.4 Parking

Parking lots exist reasonably near virtually all facilities (Figure D.13). The layout and design of parking lots vary greatly, but capacity generally slightly exceeds present needs, and the use of existing parking generally is unassigned. Sitewide parking capacity is adequate at existing levels of program activity. Two areas of exception to this general condition are in the eastern part of the 200 area, near Building 201, as well as in the vicinity of Buildings 401, 402, and some of the laboratory modules at the APS.

Many lots are in need of repairs because of age-related deterioration aggravated by severe

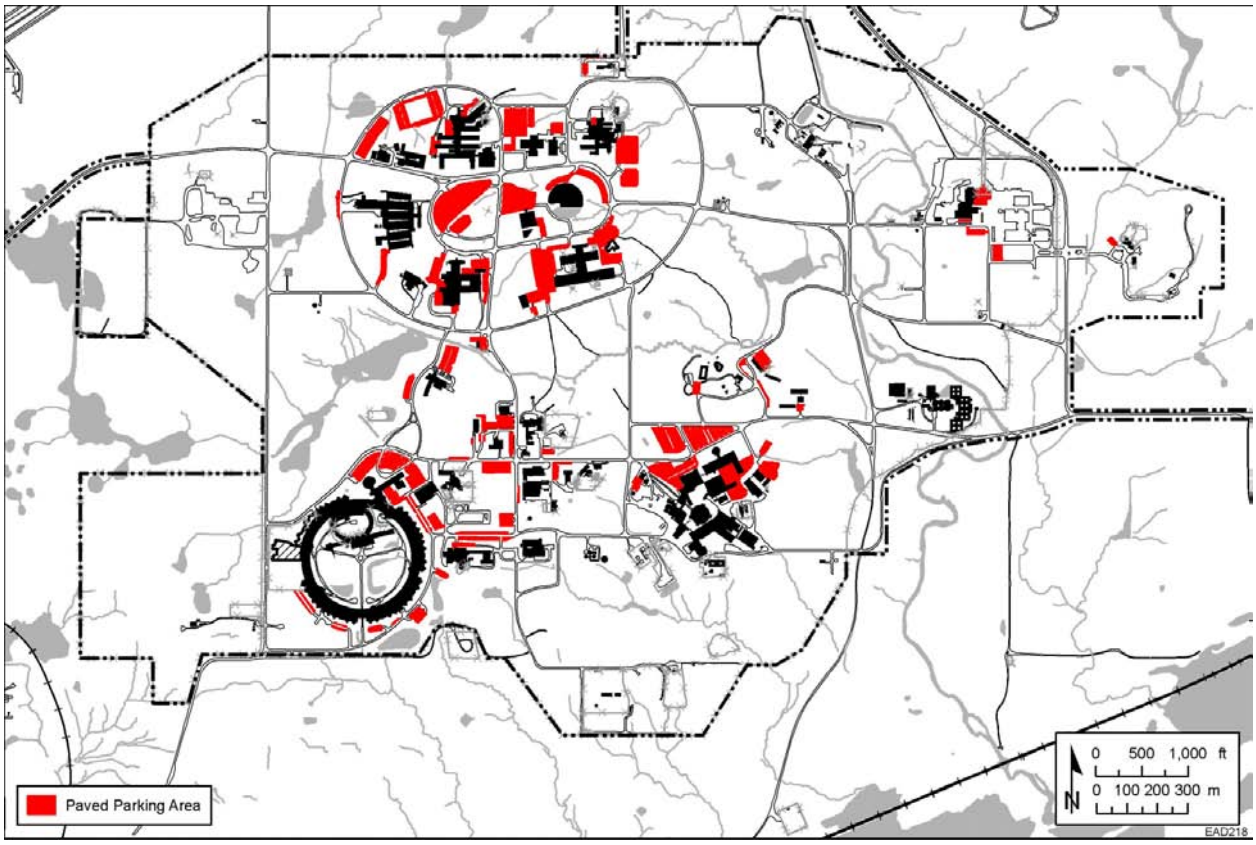

FIGURE D.13 Parking Areas

winters. Rehabilitation projects are planned to correct this problem. In older portions of the site, parking and circulation routes are not segregated according to modern practices. In general, these are residual conditions occurring where longer-range objectives include removal of obsolete facilities.

D.2.1.5 Walkways

Some 7,700 linear feet of sidewalk on-site connect parking areas with buildings and, in the 200 area, provide a pleasant connection between the buildings fronting on the Inner Circle Drive. Numerous trails cross the wooded portions of the site, connecting various subareas. The trails are used frequently during the summer and in fair weather and are a site amenity. These trails, as well as the roadways, serve as a recreational and physical fitness resource for employees during off-duty hours and lunch breaks.

D.2.1.6 Civil Infrastructure Condition Summary

Overall, the site's civil infrastructure is in need of substantial maintenance and improvement, at a cost approaching $6 million. Parking lots present the single greatest need for maintenance and improvement, accounting for nearly 2/3 of all identified deficiencies, aside from needed additional spaces where shortages are now evident. The majority of these needs reflect deferred maintenance requirements; parking lots are classified as being in "poor" condition under the ACI. By contrast, the condition of the site sidewalks is rated as adequate, with a summary condition index of only 0.03. Deferred maintenance for walks is rated "excellent" (ACI = 0.99). Outside the 200 area, walks serve primarily to carry employees from the nearby parking to and from building entrances; they do not constitute an overall all-weather pedestrian system. Roads, which constitute more than half of the asset class

value, are in need of substantial upgrading, with a summary condition index of 0.24 and ACI = 0.76 ("fair," but nearly "poor"). The most recent sitewide recapitalization of the roadway system was in the early 1980s, and the pavement conditions have generally deteriorated sufficiently that base damage might occur under harsh weather conditions.

D.2.2 Sitewide Security Infrastructure (Security Fencing and Guard Posts)

The sitewide physical security infrastructure consists of three guard posts to admit vehicles and approximately 38,500 feet of perimeter fencing, with addition fencing inside the site that primarily serves a safety function, in contrast to the perimeter condition (Figure D.14). Because of the function of these assets, they generally meet a high standard of repair and condition. The east gate guard post (Facility 091) was completely replaced and fully modernized in FY 2004, and the west gate guard post (Facility 891) will be relocated in the near future and rehabilitated in conjunction with roadway improvement to facilitate improved traffic flows, accommodate increased commuter volume, and improve security capabilities. Overall, this infrastructure has a summary condition index of 0.03 and an "excellent" ACI rating (0.99).

D.2.3 Sitewide Safety Infrastructure (Radio Repeater and Fire Alarm System)

The predominant asset in this category, the fire alarm system, is considered for deficiencies with the various buildings and structures throughout the site, rather than as a single "system," because of the necessity to associate safety needs as directly as possible with each operating facility, reflecting the way that site assets are managed. (See also Appendix G, Section G.1.) Several remaining on-site radio repeaters are co-capitalized with the ledger entries for the Security building and Fire Department (Buildings 302 and 333), but they are recorded separately under FIMS. The summary condition of the radio repeater requires minor upgrades, but the ACI ratio is "excellent" at 1.00.

Because of new DOE mandates, the entire current Argonne radio system will need to be replaced in the near future. The plan is to migrate, in a joint effort with the state of Illinois and Motorola, to a state-wide radio system that will provide interoperability with many local, state, and federal agencies. This will take place in FY 2006 and needs to be funded at approximately $950,000. Incorporated into the design will be an E-911 system.

Fire protection remains an ongoing concern at Argonne, although the primary disaggregated needs in the facilities are in suppression and other physical systems, rather than the alarm and reporting systems. A capital improvement project has been established to fund a $450,000 head-end replacement to accommodate node growth as additional reporting capabilities and equipment are added to the reporting system. This cost has not been reported through CAS inspections.

D.3 Site Utility Systems

Argonne operates the following government-owned utility systems:

1. Steam generation and distribution
2. Natural gas distribution
3. Domestic water treatment and distribution
4. Laboratory water distribution
5. Canal water treatment and distribution
6. Sanitary wastewater collection and treatment
7. Laboratory wastewater collection and treatment
8. Storm sewer
9. Chilled water generation and distribution
10. Electric power distribution
11. Telecommunications

Vendors and public utilities supply natural gas, oil, coal, electric power, water, and telephone service to Argonne. The following sections contain descriptions of the site utility systems,

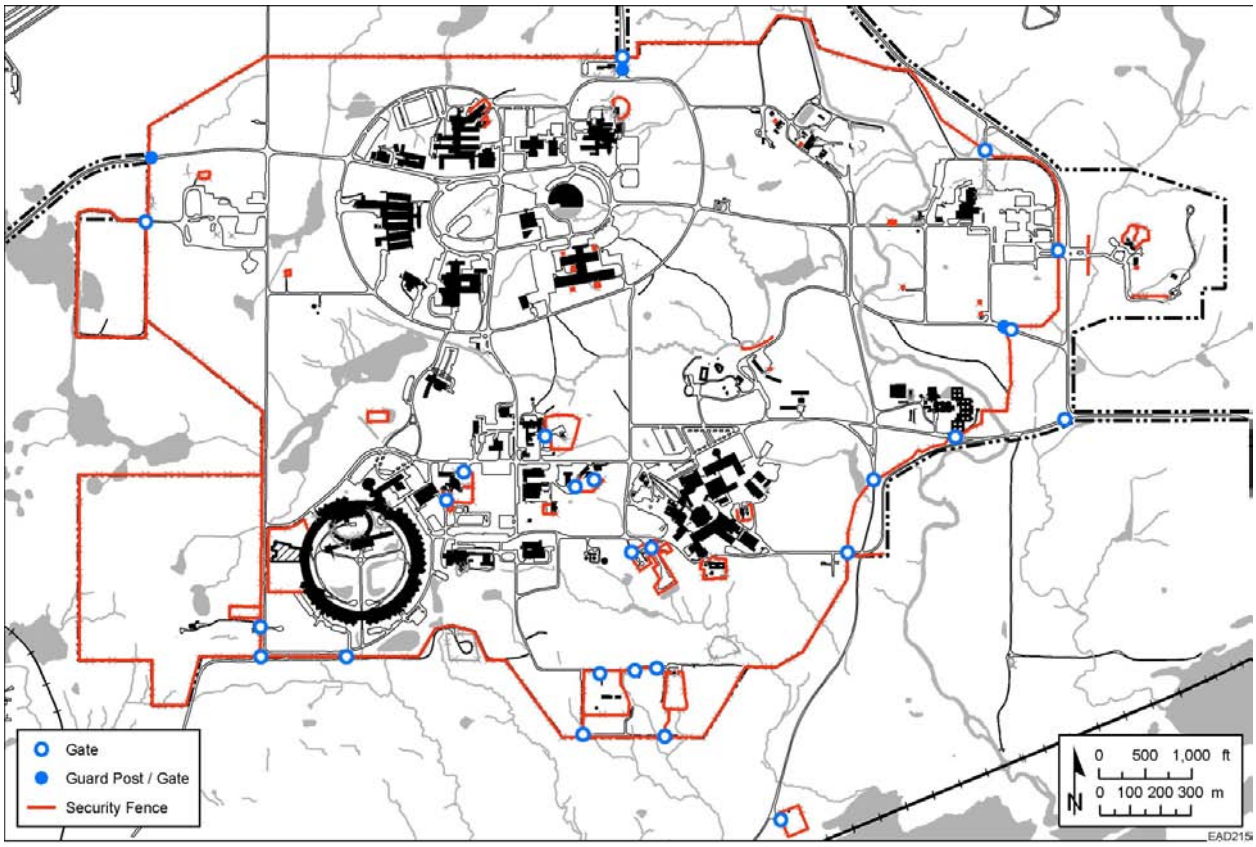

FIGURE D.14 Sitewide Security System

simplified maps of the systems, assessments of the various utility systems, and suggestions or plans for improvements.

The condition of the infrastructure and utility systems is summarized in Table D.2 (at the end of this appendix).

D.3.1 Steam Generation and Distribution

The Central Heating Plant (CHP) generates most of the steam required by the Laboratory. An extensive piping network is used to distribute the steam to most buildings. Steam is used primarily for central heating.

D.3.1.1 Steam Generation

The CHP consists of five Wickes conventional water tube boilers and various auxiliary systems. Four of the five boilers have a rated capacity of 85,000 pounds per hour (lb/h) each; the fifth has a rated capacity of 170,000 lb/h. The present maximum operating capacity of the small boilers is approximately 72,000 lb/h each; that of the large boiler is approximately 110,000 lb/h on coal. The maximum operating capacity of the total CHP is 398,000 lb/h of saturated steam at 190 pounds per square inch gauge (psig) on a combination of natural gas and coal.

Originally, all five boilers burned coal; however, in 1973 the plant was converted from coal to gas/oil to meet environmental requirements. In 1981, the large boiler was reconverted to coal only to reduce fuel costs. A flue gas dry-desulfurization scrubber was installed at the same time so that high-sulfur coal could be used. In 1997, the large boiler was modified again; natural gas burners were installed to enable use of two types of fuel. The large boiler is base-loaded in cold weather, but it is too large to provide stable operation at reduced loads in warm weather on

coal. The four small (gas) boilers are used as required for peak loads and in warmer weather.

The principal fuels used for generating steam at the CHP are natural gas and low-sulfur Illinois basin coal. Gas supply is discussed in Section D.3.2. Coal is purchased from brokers according to the prevailing cost, delivered by barge to the Lemont barge terminal, and then trucked to the site. Argonne has established "just-in-time" delivery of coal from the terminal to the site to minimize on-site storage and related environmental effects.

D.3.1.2 Steam Distribution

The existing steam distribution system (Figure D.15) starts at Building 108, between the east area and the 200 area. The CHP supplies the entire Argonne site, except for the 500 area (laboratory and sanitary sewer treatment plants) and the 600 area (lodging). Buildings in the 600 area are heated by packaged gas-fired boilers. The 500 area is serviced by propane systems.

Steam is distributed on-site through two 14-in. lines that leave the CHP and feed the 12-in. 200 area loop, a 10-in. line to the east area, and a 14-in. line to the 360 area. A 10-in. main, fed from the 12-in. 200 area loop, delivers steam to the buildings in the 300 area. The 200 area distribution system is located in concrete tunnels, with the building pipe connections in direct-burial steel conduit or in formed hydrophobic powder. Lines serving the east area, the 300 area, and the 360 area are mainly aboveground. The condensate return (pumped from receivers in individual buildings) runs through pipes parallel to the steam system and into two 100,000-gallon (gal) storage tanks outside the boiler plant. Distribution lines are insulated with 85% magnesia insulation, covered with waterproof felt, and painted. In FY 2004, additional insulation, with jacketing, was added to the above-grade steam pipe.

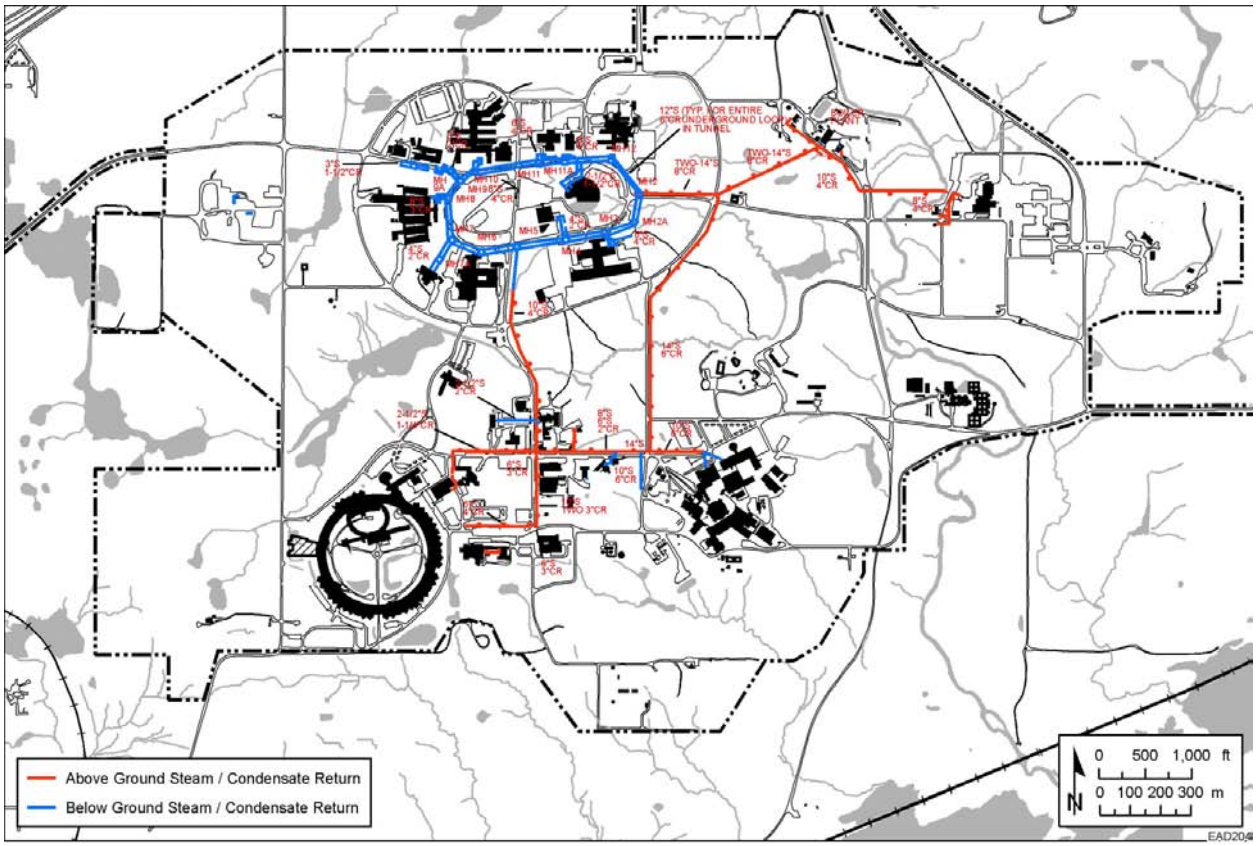

FIGURE D.15 Steam Distribution System

Currently, the system distributes steam at 190 psig to all buildings on-site. Local stations typically reduce the pressure to 15 psig. Lower-pressure steam is then used for space heating and miscellaneous building services.

The underground steam distribution system was rehabilitated in FY 1986. The existing aboveground steam distribution system is more than 40 years old, beyond normal life expectancy. Ultrasonic testing in 1996 confirmed the integrity of the aboveground distribution piping.

The CHP was completed in 1951. Adequate maintenance of the plant became difficult and very costly, because replacement parts for many of the components were no longer available. To restore reliability of the steam supply, Argonne rehabilitated the CHP in FY 1999. Several of the major operating components have been upgraded, control systems have been upgraded to direct digital systems, and dual fuel capability has been added to Boiler No. 5. Major electrical switchgear and a standby generator have been replaced.

The average cost of steam generation depends on several variables, such as the costs of water, electricity, and fuel. However, fuel cost is the major factor in determining the average cost of steam.

The steam distribution system at Argonne is generally in fair condition, with approximately $8.4 million (ACI = 0.85) in deferred maintenance; overall, it requires minor rehabilitation. The central steam plant itself, including the associated crusher house and shaker house, require major upgrades, and the distribution system itself has substantial deferred maintenance, as well as significant unmet improvement needs.

D.3.2 Natural Gas Distribution

Natural gas is now purchased under an area-wide contract through the Defense Energy Supply Center (operated by the Defense Logistics Administration). Nicor, Inc., delivers gas through its distribution grid to the Laboratory on a special rate transportation contract.

A 6-in. branch line from the nearby high-pressure Nicor main supplies gas at 150 psig to a regulator at Building 108, which reduces the pressure to 60 psig. From that regulator, gas is piped to the CHP, where it is metered for the boilers. A branch line extends to the north of the CHP, where the sitewide gas supply is metered and regulated to maintain 10 psig. Gas is then distributed to the site for use in laboratory and experimental areas. Figure D.16 shows the gas distribution system.

The entire distribution system was replaced in FY 1999 and FY 2000. The replaced on-site gas distribution lines were more than 40 years old. No CAS deficiencies are identified for the natural gas distribution system; the system is rated "excellent," with ACI = 1.00.

D.3.3 Domestic Water Treatment and Distribution

Since 1996, water for Argonne has been supplied by the DuPage Water Commission from Lake Michigan. The supply comes from a DuPage Water Commission line that runs parallel to Cass Avenue and connects at a new pressure reduction station (Building 167) adjacent to the CHP. From there, water is pumped into the general distribution system, which provides for domestic and laboratory process use and for fire protection. Recent guidance from the Water Commission to all customers with independent sources (including Argonne) has been to keep such alternate sources available and on-line in case of an emergency interruption to county supplies or disruption to the county distribution system. This policy change, in keeping with safeguards identified by the Office of Homeland Security, requires Argonne to maintain the operating conditions of its wells and on-site treatment plant in a higher state of readiness than was previously the case. This requirement is reflected in the reporting of mission-critical and mission-dependent facilities.

Prior to 1996, water was pumped from four wells and treated at the water treatment plant (Facility 129). The wells and treatment plant are maintained in standby condition in case of a major interruption in the DuPage line.

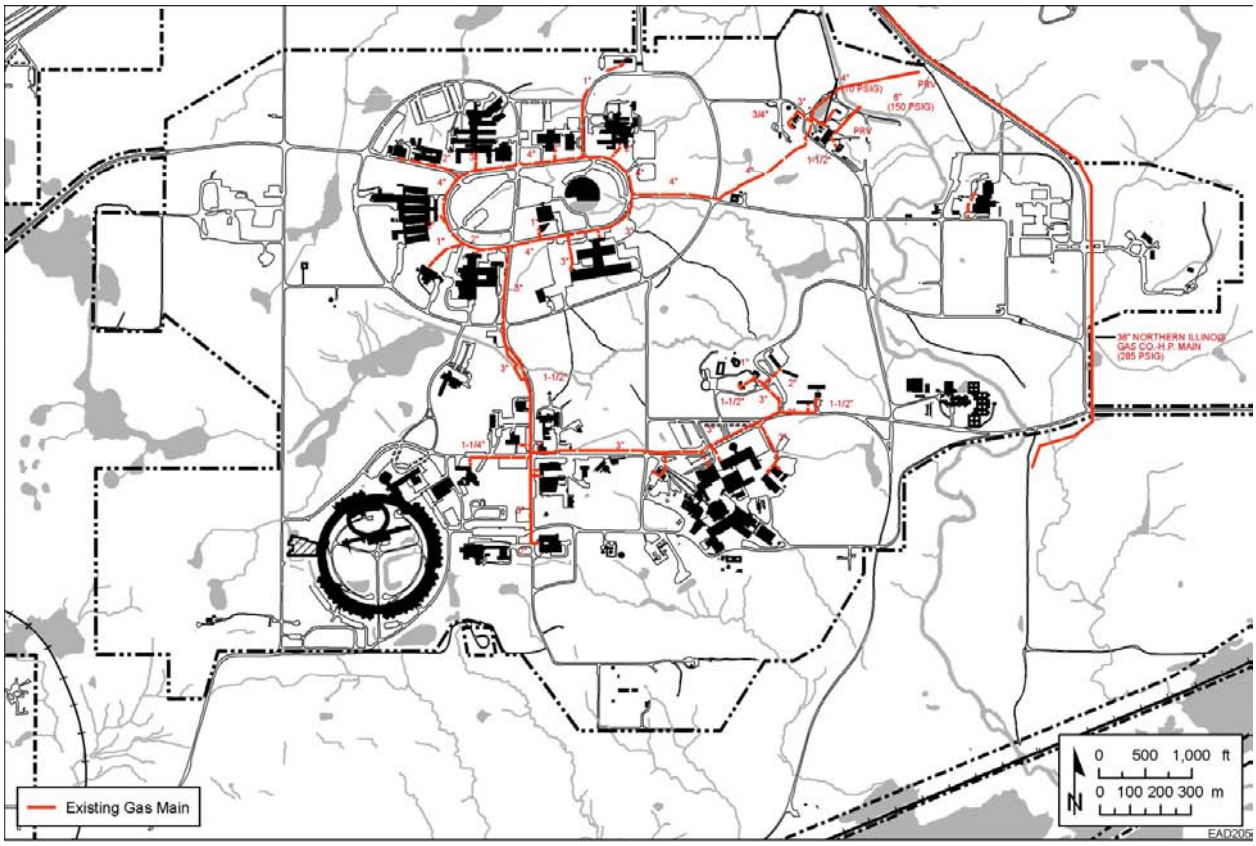

FIGURE D.16 Gas Distribution System

D.3.3.1 Water Wells (Standby)

The four shallow wells, each approximately 328 ft deep, draw water from the Niagara dolomite aquifer; their combined capacity is approximately 2.23 million gallons per day (MGD). These wells pump only hard water, which must be treated before distribution to the site. One deep well, drawing from the Galesville sandstone formation, is the only underground source of soft water on-site; however, this well has been inactive since 1957 because of hydrologic problems.

D.3.3.2 Water Treatment Plant (Standby)

The standby water treatment system covers the risk of interruption in the supply of Lake Michigan purchased water. Treatment at the water treatment plant (Facility 129) includes ion-exchange softening, iron removal, pH adjustment, filtration, and chlorination. The treated water is then routed to a 650,000-gal ground-level storage tank. High-lift booster pumps operating in parallel draw the treated water from the tank and send it into the distribution system.

A pumping station discharges regeneration waste from the ion-exchange water softeners into the DuPage County sewer system. Four pressure filter tanks, recently rehabilitated to maintain required water quality, remove fine particles and organic compounds from the water. The backwash from these filters is discharged into the equalization pond (at the CHP), which empties into the laboratory sewer system or to the DuPage lift station, depending on levels of total dissolved solids. The pressure filter tanks limit the capacity of the water treatment plant to approximately 1.0 MGD, which is adequate to satisfy current sitewide demand for domestic and Laboratory water.

D.3.3.3 Water Distribution Systems

The existing domestic and laboratory water distribution systems were upgraded in FY 1991. Most of the old cast iron piping was replaced with new cement-lined ductile iron pipe with polyethylene exterior wrapping. The capacity of the distribution systems is adequate to handle identified present and future water flows. Rehabilitation of the domestic and fire water pumping and storage system was completed in FY 1994.

D.3.3.4 Domestic/Fire Protection Water System

Water for domestic use and fire protection is distributed through a common network that serves most of the site (Figure D.17). The average daily flow rate in this system is approximately 0.442 MGD. The system has three elevated storage tanks: Facility 565 (500,000 gal) near the west area and south of Water Tower Road, Facility 42 (150,000 gal) in the east area, and Facility 564 (300,000 gal) in the 300 area. In addition, Facility 568, a ground-level storage tank, can hold 650,000 gal. A portion of the water stored in these tanks is reserved for fire fighting and for automatic sprinkler systems in various buildings. All of the domestic water tanks were upgraded in 1992, and the tanks were cleaned and painted both inside and out. Extensive repairs were also made to extend the service lives of the tanks significantly.

The domestic/fire water distribution system is generally adequate, with approximately $1.0 million (ACI = 0.95) in deferred maintenance. The inclusion of the lateral distribution runs to buildings with the main distribution system would establish joint values of ACI = 0.94 and summary condition index of 0.9, both indicative of adequate condition.

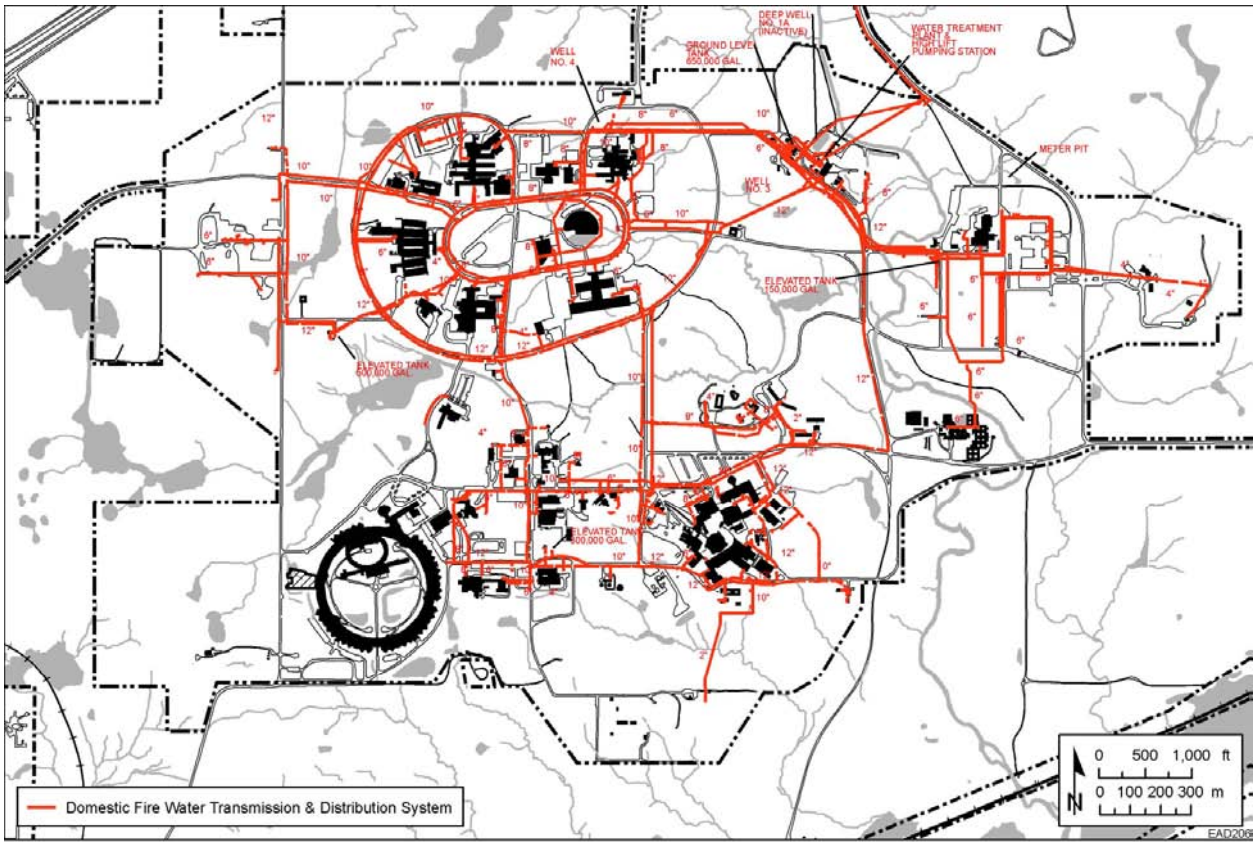

FIGURE D.17 Domestic/Fire Protection Water Treatment and Distribution System

D.3.4 Laboratory Water Distribution

In on-site working laboratory facilities, the water supply can become contaminated by back-siphonage. To eliminate this hazard, a separate supply system (not directly connected to the main on-site water supply system) is used for laboratory purposes (Figure D.18). Water is pumped from the on-site water system to a point above the high-water level. From there, the water is discharged through an air gap into the 75,000-gal elevated storage tank (Facility 566) near the 800 area and south of Water Tower Road. From this tank, the water flows through a distribution system to the various laboratories. The laboratory water tank was upgraded in 1992, and the tank was cleaned and painted both inside and out. Extensive repairs were also made to extend the service life of the tank significantly. The flow through the Laboratory service water system averages about 0.284 MGD.

The laboratory water distribution system at Argonne is in need of minor upgrades overall, with approximately $230,000 (ACI = 0.88) in deferred maintenance. The inclusion of the lateral distribution runs to buildings with the main distribution system would yield a summary condition index of 0.15, indicative of a requirement for minor rehabilitation.

D.3.5 Canal Water Treatment and Distribution

The canal water system consists of a water treatment facility, storage tanks, and a distribution system. Nonpotable canal water is used on-site primarily in cooling towers and, to a lesser degree, for a variety of other cooling needs, such as building air compressors.

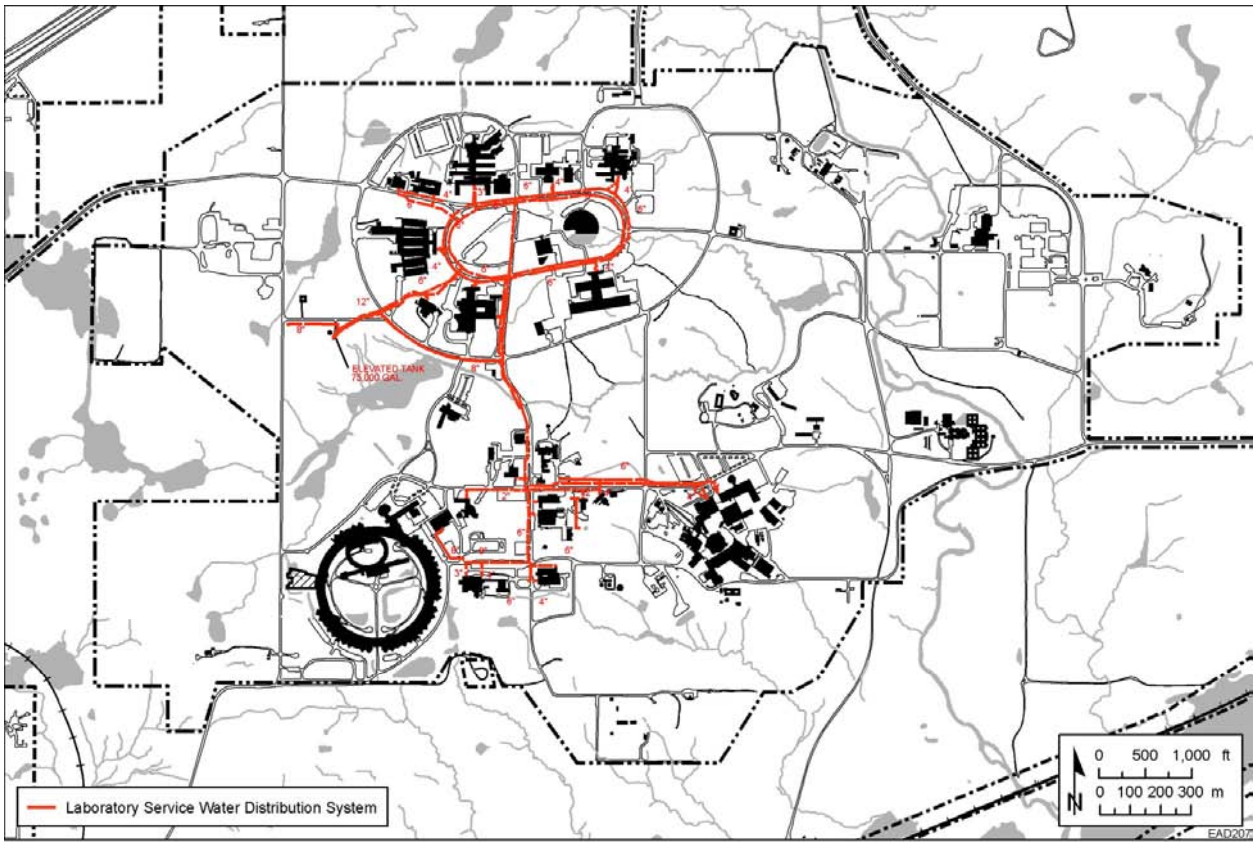

FIGURE D.18 Laboratory Water Distribution System

D.3.5.1 Canal Water Treatment Plant

Nonpotable canal water is drawn from the Chicago Sanitary and Ship Canal through an inlet structure — a raw water pump station (Facility 582) equipped with traveling screen and pumping equipment. The raw water is then pumped to a clarification-type treatment plant (Facility 583) that contains upflow basins, chemical feeders, chlorinating facilities, and a 500,000-gal ground-level treated-water storage reservoir (Facility 584). An additional 250,000-gal elevated storage reservoir (Facility 585) is located near the center of the site, east of Meridian Road and across from the Fire Station (Building 333). This last facility is degraded, and the tank structure may be in need of replacement rather than rehabilitation.

The existing design capacity of the treatment plant is 4.0 MGD. Both the raw water and treated water stations were designed for pumping capacities of up to 6.0 MGD, with principal pipelines sized for expansion. Since the addition of the APS complex, the treatment plant (Facility 583) is approximately 25% loaded. Because the plant was originally designed to accommodate expansion of cooling loads, planned maintenance activities keep the canal water treatment system readily capable of supporting all the planned (and even unforeseen) expansion needs of the Laboratory. As indicated in the discussion of the 500 area (Section D.1.7), the use of recycled treated effluent from the laboratory and sanitary sewage treatment plants as input to the canal water system is being investigated for engineering feasibility, cost efficiency, and reversibility of flow through the canal water feed line. Discharge directly into the Chicago Shipping and Sanitary Canal would reduce the impact of all discharges from *limited recreational contact* with water in Sawmill Creek and the Des Plaines River to *no recreational contact* with water in the canal.

D.3.5.2 Canal Water Distribution System

The canal water distribution system (Figure D.19) serves the entire Laboratory. From the treatment plant, clarified water is pumped into a completely separate, nonpotable canal water distribution system, which includes a 250,000-gal elevated tank (Facility 585) that serves the 100, 200, 300, 360, and 400 areas. The existing canal water distribution system was upgraded in FY 1991 by replacing most of the cast iron piping with new cement-lined ductile iron pipe with polyethylene exterior wrapping. The average daily flow rate in this system is approximately 0.501 MGD.

The canal cooling water system was introduced to relieve the general water supply system from additional demands due to forecast cooling load growth, especially demands associated with the development of the 360 area. Most of the present canal water treatment plant and associated systems were constructed and placed in operation in 1962. Additions and upgrades of the piping systems have occurred more recently, as have some treatment plant improvements. Many components of the treatment plant and distribution system are aged or beyond their expected useful life expectancy, which contributes to increased operating and maintenance costs.

Several areas of concern exist regarding continued operation of the canal water system. One the two existing clarifiers (west) and most of the supporting equipment need immediate repair or replacement. The east clarifier was replaced in 2003. The two water storage tanks have been in service for more than 30 years and need improved access for repairs to extend their useful service life. The only source of water sufficient to serve the plant crosses wetlands and a river. Although this line appears to be in an acceptable condition, concerns for long-term use require verification of its actual condition.

The Laboratory has carried out extensive work on the canal water system over the last two years. The elevated storage tank (Facility 585) was inspected, and some repairs were completed, though additional work is required. The ground storage tank (Facility 584) needs repairs. Extensive work has been carried out at the treatment plant (Facility 583). One of the claifiers was replaced, and much of the major electrical support equipment was upgraded. Selected valves and operating equipment were also improved. Additional work on the system included improvements to the pump house (Facility 582), rerouting of the treatment plant blowdown to the laboratory sewer treatment plant, and elimination of the sludge collection basins.

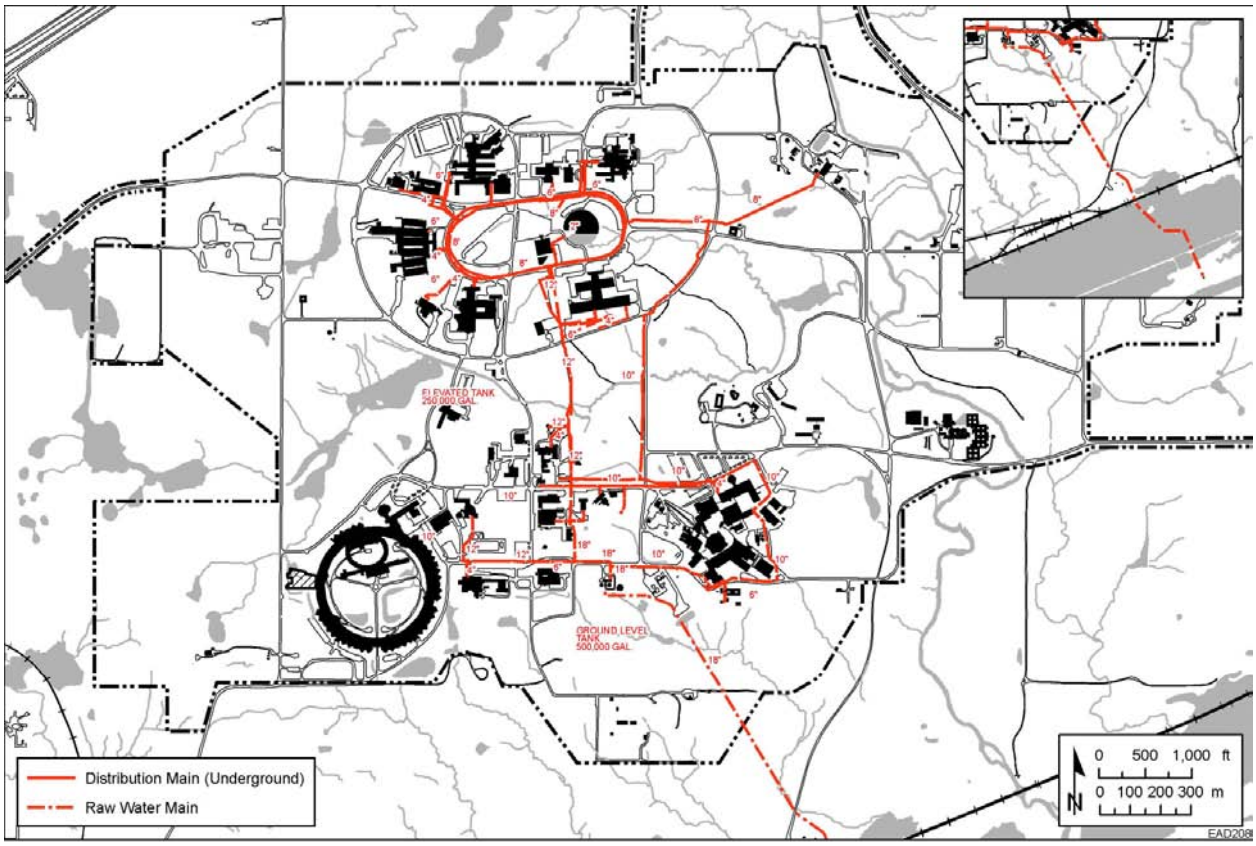

FIGURE D.19 Canal Water Distribution System

The canal water treatment and distribution system is in need of significant rehabilitation and has been the subject of significant work at the treatment plant itself. Approximately $550,000 (ACI = 0.91) in deferred maintenance remains, primarily in the treatment plant and the associated lines, as well as in nearby storage tanks that require significant refurbishing.

D.3.6 Sanitary Wastewater Collection and Treatment

Sanitary sewage from various buildings is conveyed through an underground sewer system to the sanitary wastewater treatment plant (SWTP). The system is for domestic waste; drains subject to radioactivity or chemical contamination are not connected to this system.

D.3.6.1 Collection System

The existing sewer collection system (Figure D.20) consists of approximately 8.3 miles of main-line sanitary sewers, ranging in diameter from 4 to 18 in. Sanitary wastes from most of the buildings are conveyed by gravity through the piping system to the SWTP. Sanitary waste from the east area flows by gravity into a sewage lift station, which pumps into the gravity sewer main along Railroad Drive.

Because of upgrading and rehabilitation of the piping system completed in 1994, the collection system is now a mixture of old and new pipes and is composed of three main sections: original vitrified clay or cast iron pipe more than 25 years old, original vitrified clay pipe that has been rehabilitated through the injection of acrylamide grout into cracks and pipe joints, and new polyvinyl chloride sewer pipe. The upgrade also

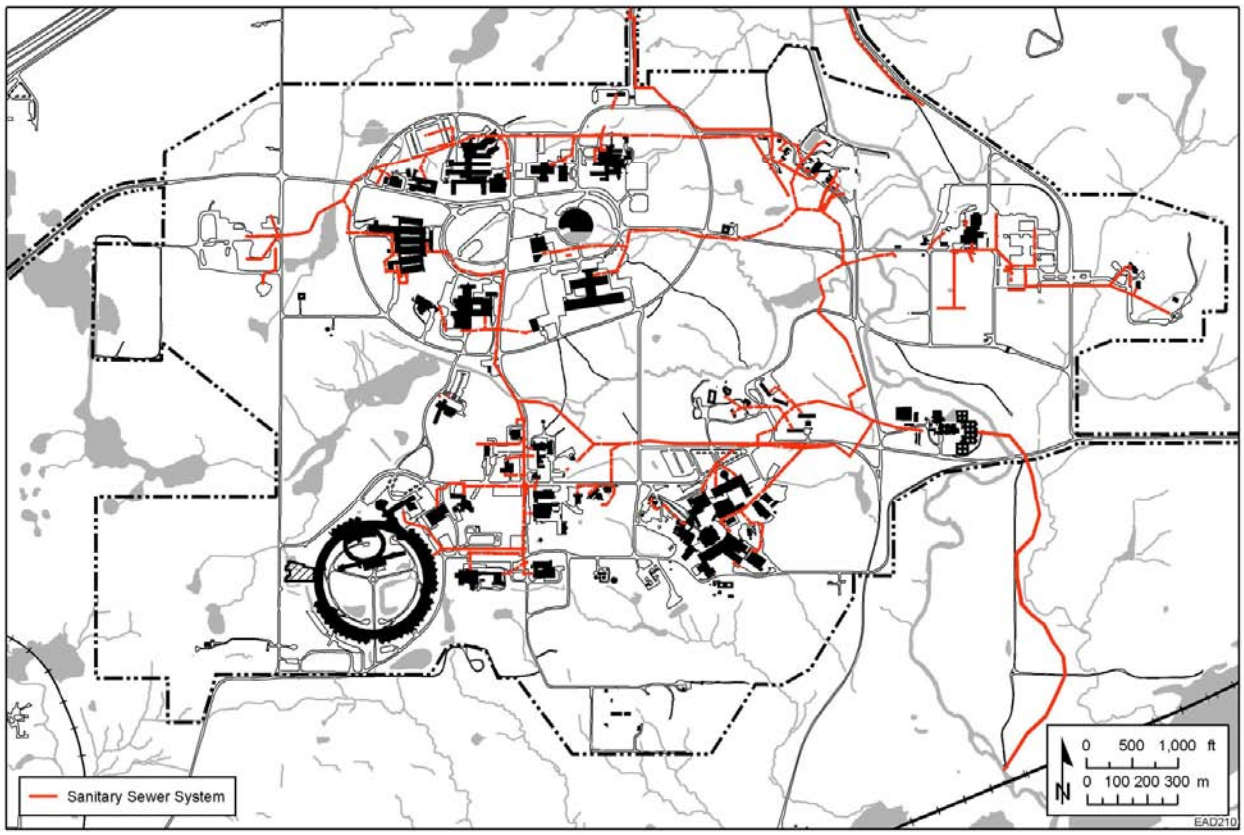

FIGURE D.20 Sanitary Sewer System

increased the sewage handling capacity of the collection system to accommodate increased flows from the APS area and eliminate surcharge conditions in other sections of the line. Computer modeling indicates that the new system can handle an average flow of 0.738 MGD.

D.3.6.2 Sanitary Wastewater Treatment Plant

The SWTP, Facility 570 and Building 576, consists of influent flow meters; comminutors; primary clarifiers with an Imhoff tank below (clarigestor); trickling filters, final clarifiers, and intermittent sand filters; a mechanical sludge dewatering system; and sludge drying beds (Figure D.20). The plant consists of two identical treatment trains (clarigestor, tricking filter, final clarifier, and intermittent sand filters). The original train was designed for an average flow of 0.217 MGD; the second train, added in 1959, doubled the plant capacity. Many components of the existing two-train treatment system were outmoded, undersized, or malfunctioning until a major overhaul to improve operational efficiency and reliability was completed in 1995–1996. The current capacity is an average daily flow of 0.5 MGD and a peak hydraulic flow of 1.4 MGD.

Additional rehabilitation work on the sanitary sewer system is required on some of the lateral lines (off the main lines) that service individual buildings. Excessive inflow and infiltration into the sanitary sewer collection system occur during precipitation or snow melt-off events throughout the year. The result is both overload of the treatment plant and dilution of the treatment process.

The sanitary sewer treatment plant and collection system is generally adequate, with approximately $250,000 (ACI = 0.99) in deferred maintenance, resulting in an “excellent” rating regarding the level of deferred maintenance. This

is primarily because of significant modernization and plant upgrades under line item funding during the 1990s.

D.3.7 Laboratory Wastewater Collection and Treatment

Established policy and practice require that Argonne employees put all known radioactive liquid wastes in special containers that are collected regularly and sent to a separate processing building for treatment to reduce waste volume. Residual wastes are prepared for further handling and disposal. To prevent inadvertent emptying of radioactive waste or other toxic substances into laboratory sinks or drains, a separate drain system is installed in all radiochemical laboratories. All such laboratory sewers are connected to the laboratory wastewater treatment plant (LWTP).

D.3.7.1 Collecting, Testing, and Discharging Laboratory Water

The separate laboratory sewer system serves all areas of the Argonne site, except the east area and the 800 area. Laboratory sinks or floor drains that might receive chemical or radioactive wastes are connected to tandem 1,500-gal retention tanks within each facility; wastewater is monitored for radioactivity before discharge to laboratory sewers. When tests show wastewater radioactivity to be within the permissible limits, the contents of the retention tank are pumped into the laboratory sewer system. When the radioactivity of the wastewater exceeds permissible limits, the contents of the tank are pumped into a tanker truck and transported to Building 306. Waste volume is then reduced by evaporation, filtration, ion exchange, and flocculation. Effluents from this process are discharged into the laboratory sewer system.

D.3.7.2 Laboratory Wastewater Collection System

The existing laboratory wastewater collection system (Figure D.21) consists of approximately 30,000 ft (5.7 miles) of main-line sewers, ranging in diameter from 4 to 18 in. At most locations, the laboratory and sanitary collection systems run in parallel, have the same slope, and are constructed of the same pipe material; they often run through a double manhole, with an internal concrete wall to segregate the flows. Laboratory wastes from most of the buildings are conveyed by gravity through the piping system to the LWTP.

Because of upgrading and rehabilitation of the piping system completed in 1994, the collection system is now a mixture of old and new pipes and is composed of three main sections: original vitrified clay or cast iron pipe more than 25 years old; original vitrified clay pipe that has been rehabilitated through the injection of acrylamide grout into cracks and pipe joints; and new polyvinyl chloride sewer pipe. The upgrade also increased the sewage handling capacity of the collection system to accommodate increased flows from the APS area and eliminate surcharge conditions in other sections of the line. Computer modeling indicates that the new system can handle an average flow of 1.117 MGD.

D.3.7.3 Laboratory Wastewater Treatment Plant

The original LWTP handled only influent flow equalization, chemical neutralization of acidic wastes, and primary sedimentation. Reported excursions from National Pollutant Discharge Elimination System (NPDES) discharge permit limits, caused by inadequate treatment at the LWTP, posed an environmental liability. Therefore, a new facility was designed to provide treatment capability for heavy metals, suspended solids, volatile organic compounds, and semi-volatile organic compounds. Construction of the new treatment works was completed in 1997.

The new treatment system combines portions of the existing LWTP with new equipment and facilities to provide increased flow capacity of 1.1 MGD and improved treatment capabilities.

Additional rehabilitation work on the laboratory sewer system is still required on some of the lateral lines (branching off the main lines) that service the individual buildings. The outfall sewer from the LWTP (which contains the combined flow of the LWTP and the SWTP) to Sawmill Creek is also in need of repair.

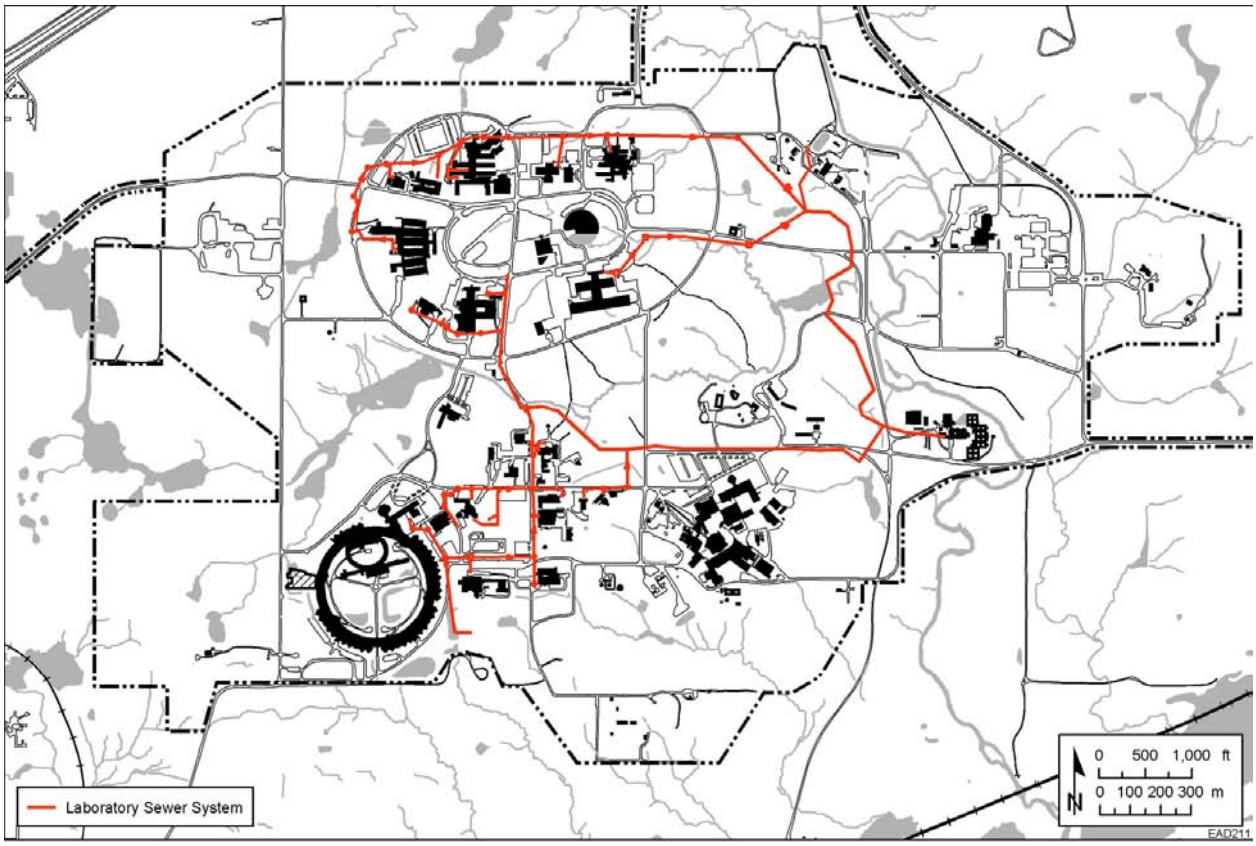

FIGURE D.21 Laboratory Sewer System

As with the sanitary sewer system, the laboratory system has been the recent recipient of very significant recapitalization and plant modernization. The laboratory sewer treatment plant and collection system is therefore generally adequate, with approximately $76,000 (ACI = 0.99) in deferred maintenance, resulting in an "excellent" rating regarding the level of deferred maintenance and a summary condition index (TRIC/RPV) of 0.24, indicative of requiring significant "minor" rehabilitation, primarily referencing the remaining sewer mains not rehabilitated during line item upgrades in the 1990s.

D.3.8 Storm Sewers

Roof drains, downspouts, and certain non-contact cooling water discharges are connected to storm sewers at most permanent buildings (Figure D.22). Storm sewers are discharged into the nearest suitable outfall point, usually a creek or a well-drained low area. Existing storm sewer discharges do not contain provisions for detention or retention of storm water, other than natural capacities inherent in the surface drainage system.

Most of the storm sewers on-site are more than 25 years old. At present, the storm sewer system collects water from floor drains in several buildings and blowdown wastewater from cooling towers. All sources of storm water are directed toward collection systems that lead to the outfalls covered under the NPDES permits. Though the water is untreated, the discharges are permitted and are monitored as required by the NPDES permit; the results of the monitoring are transmitted to the state of Illinois.

Recent trends indicate that, in the future, regulating agencies will probably require stricter control of storm water discharges. Present discharges from treated water sources such as cooling tower blowdown, air compressors, and once-through cooling systems will probably

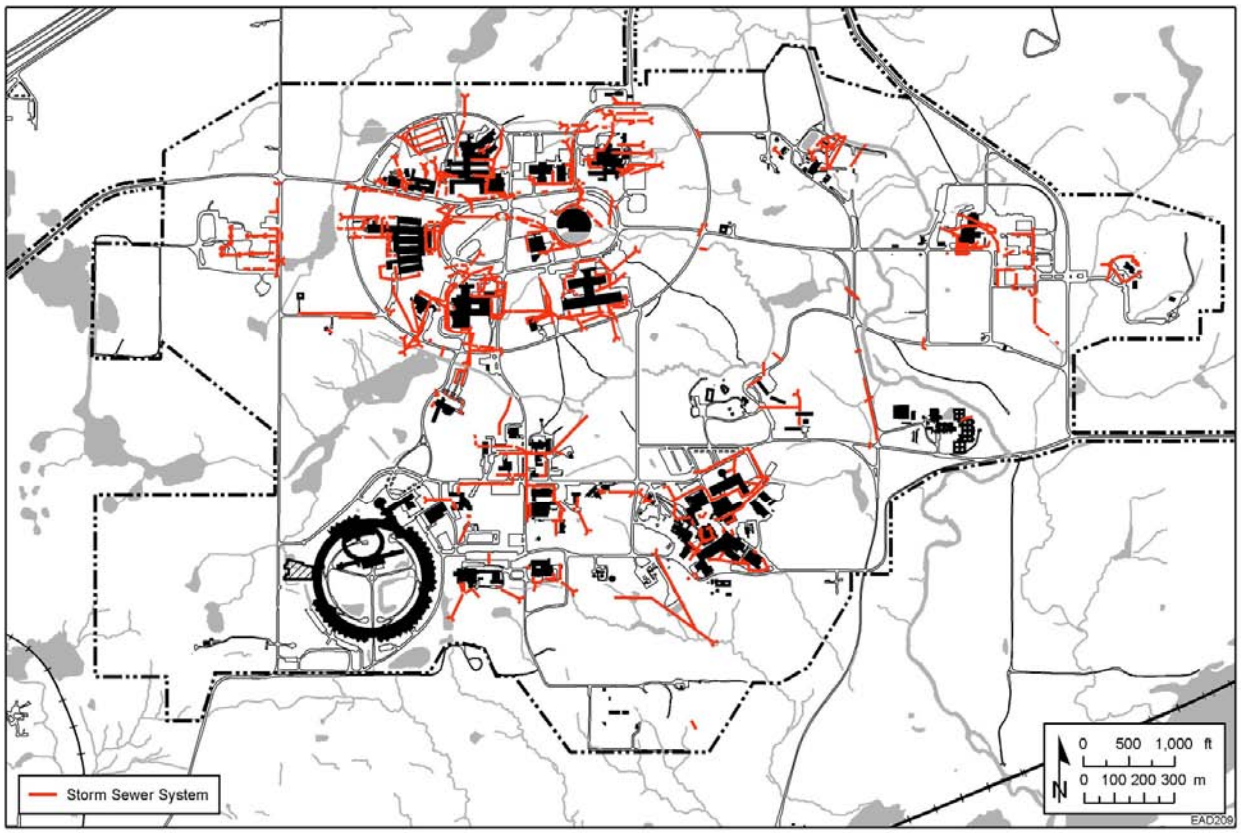

FIGURE D.22 Storm Sewer System

require treatment prior to discharge, and building floor drains will probably need to be rerouted to the laboratory treatment system. Storm water presently enters the treatment systems through inflow and infiltration at percentages unacceptable for standard systems. In addition, storm sewer lines and discharges are aging and in need of major maintenance, including cleaning and repairing of culverts, discharges, and swales along roads.

Planned maintenance is addressing these concerns through work now under way and via additional proposed projects. Discharge of untreated water from cooling towers, floor drains, etc. at selected buildings is being redirected to the appropriate treatment collection system, and investigations are continuing to identify specific locations of additional sources. A one-year study is also under way to identify large sources of storm water inflow into the wastewater treatment systems. Maintenance efforts are continuing to identify and resolve storm sewer system problems, which in some cases affect the daily operation of buildings and roadways.

The storm sewer system, consisting primarily of underground piping and road culverts, has been rehabilitated through significant maintenance actions in the recent past and is in overall satisfactory condition, requiring only $61,000 in deferred maintenance reductions (ACI = 0.98; “excellent”) and slightly more than $100,000 in overall upgrades. The summary condition index is 0.03.

D.3.9 Chilled Water Generation and Distribution

Chilled water for process and comfort cooling is provided by three separate chilled water systems, serving many of the major buildings on-site. These systems serve the 360 area, the APS, and the 200 area.

D.3.9.1 360 Area Chilled Water System

The 360 area chilled water system has a present total cooling system capacity of 2,500 tons, provided by a 1,500-ton chiller and a 1,000-ton chiller in Building 364. The two chillers are operational and are dedicated to the 360 area. Presently, the chilled water system peak load for this area is 1,350 tons. The chillers are in need of replacement. Plans are to replace them under the energy savings performance contract.

D.3.9.2 APS Chilled Water System

The APS chilled water system serves only the APS complex and has a present total cooling capacity of 9,000 tons provided by three 2,100-ton chillers, a 1,200-ton thermal storage chiller, and a 1,500-ton chiller in Building 450. The chilled water system peak load for this area is 7,470 tons.

An additional 1,500-ton chiller installation is planned for 2005 to allow for the new Nanoscale Fabrication Facility, which will increase the area cooling load by 2,400 tons. In 2006, an additional 1,500-ton chiller installation is planned to allow for the new Laboratory/Office Module 437, new beamlines, and a new linac storage facility estimated to increase the area cooling load by 1,050 tons.

In 2007–2010, an additional 1,500-ton chiller installation is planned to allow for the new laboratory wing expansion and structural genomics research construction that is expected to increase the 400 area cooling load by 950 tons.

D.3.9.3 The Central (200 Area) Chilled Water System

The central chilled water plant, located in Buildings 371 and 371D (Figure D.23), consists of four electric-powered centrifugal chillers and associated circulating pumps. The original plant, built in 1989 in Building 371D, consisted of three 1,067-ton chillers. The plant was expanded in 1997 with the addition of a 1,200-ton electrical centrifugal chiller in the Building 371 high bay. Approximately 4.2 miles of buried chilled water supply and return piping connects most of the major buildings in the 200 area (202, 205, 212, and 223) to the central chilled water plant. Four additional buildings (203, 211, 221, and 222) were connected at the beginning of FY 1993. Building 200 was added to the system in FY 1999. In FY 2004 an additional 1,500-ton absorption chiller was installed in Building 212; it ties into the central chilled water loop for additional capacity.

Reliable chilled water systems are crucial to buildings on-site. The loss of cooling for even short times can invalidate long-term experiments. Many chilled water systems serving individual buildings, aside from the central chilled water system, also serve vital process loads. The central chilled water system cannot handle the combined peak cooling requirements of interconnected buildings. However, local chillers in several buildings (200, 203, and 222) reduce the demand on the central plant. The Laboratory conducted a chlorofluorocarbon replacement study to determine a course of action for phasing out these refrigerants. The study identified equipment for replacement, and replacement cooling capacity in Buildings 213 and 315 was installed in FY 2004. Work is scheduled through FY 2006 to replace the remaining five chillers (3,660 T) servicing the 360 area and Building 203.

The total chilled water capability at Argonne, including the central system and local systems and the APS and 360 area systems, has been improved significantly in reliability and energy efficiency. Plans to interconnect the central chilled water system with the APS system, the 360 area system, or both have not been formalized.

Three additional cooling systems are under consideration; all are linked to the programmatic initiatives described in Chapter 2. The most significant proposal, the RIA project, has substantial cryogenic requirements related to the proposed accelerator systems, as well as the supporting new laboratory, target area, and office facilities including the Illinois Science Center.

The chilled water system performance ratings are the highest among all utilities and support infrastructure, primarily reflecting the relative youth of the system and its recent expansions in capacity and service. Because of the changing nature of research at Argonne, the system

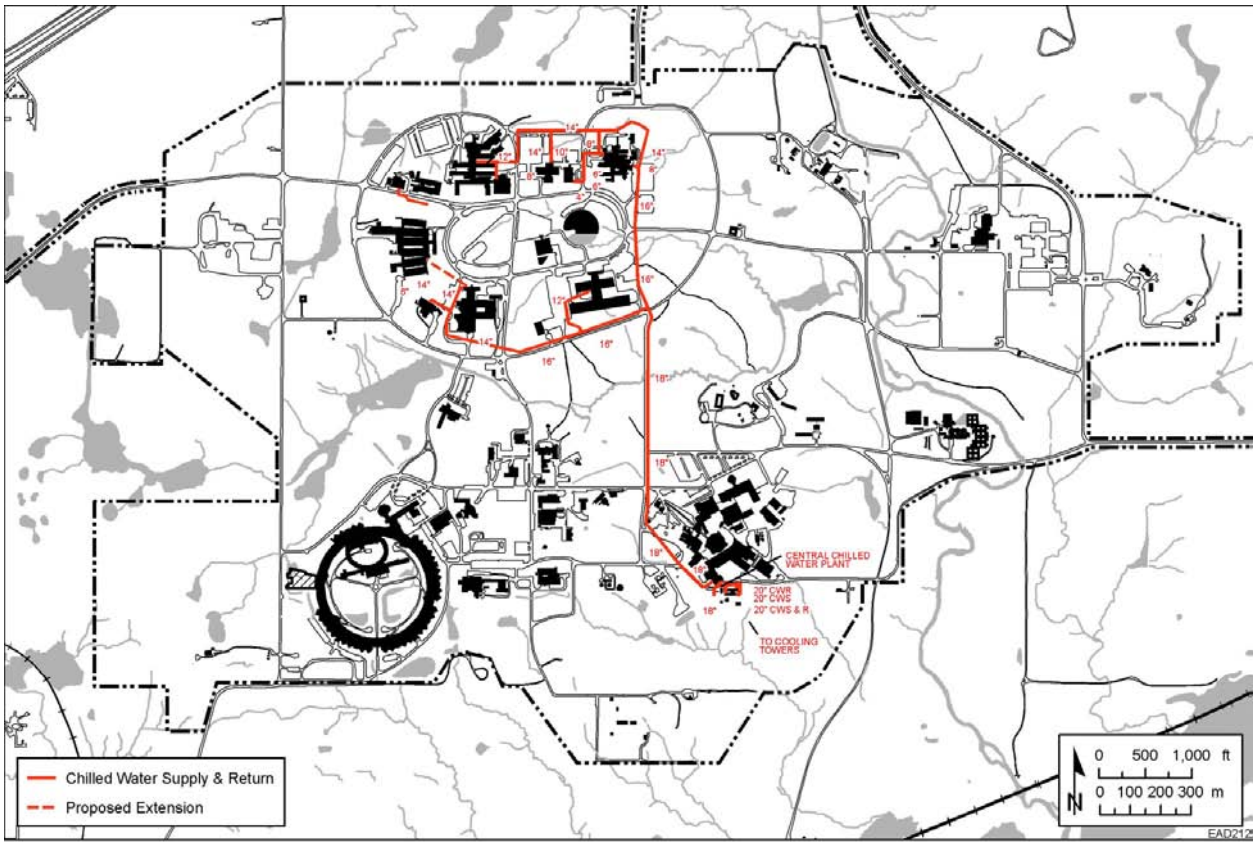

FIGURE D.23 Central Chilled Water Distribution System

capabilities and its importance are expected to grow in proportion to overall plant modernization, as well as with the addition of new mission capabilities and initiatives.

D.3.10 Electric Power Distribution

Electric power for the Argonne site is purchased from the Commonwealth Edison Company (CECo) at 138 kV. The CECo transmission system consists of two lines, fed by the Joliet and McCook generating stations and routed along the Atchison, Topeka, and Santa Fe Railroad in the Des Plaines River valley south of the site.

The federally owned, Argonne-operated main distribution system (Figure D.24) originates at Facility 543, which is adjacent to the CECo line facilities. Two 15/20/25/28-megavolt ampere (MVA) transformers (T1 and T2) and high-voltage switchgear at Facility 543 service two overhead 13.2-kV transmission lines that run north through the forest preserve to Facility 544. Distribution switchgear at Facility 544 services an underground cable distribution system that supplies most of the 200 area buildings. Overhead lines supply the rest of the site, except for the 300 area.

A separate power distribution system meets the heavy load requirements of the 300 area. Two three-phase, 138-kV lines (overhead and underground) connect the CECo transmission line at Facility 543 to the transformers at Facilities 549A and 549B in the 300 area. Three 18.75/25/31.25-MVA transformers (T4, T5, and T6) and two 30/40/50-MVA transformers (T7 and T8) provide 13.2-kV power to the 300 and 400 areas. A fourth 12/16-MVA transformer (T3) provides 13.2-kV service to buildings in the western 300 area and has an emergency standby cross-tie to Facility 544. Transformers T7 and T8 provide power to the 400 area (APS) through 13.2-kV overhead transmission lines. Three new diesel emergency generators, totaling 3,750-kW

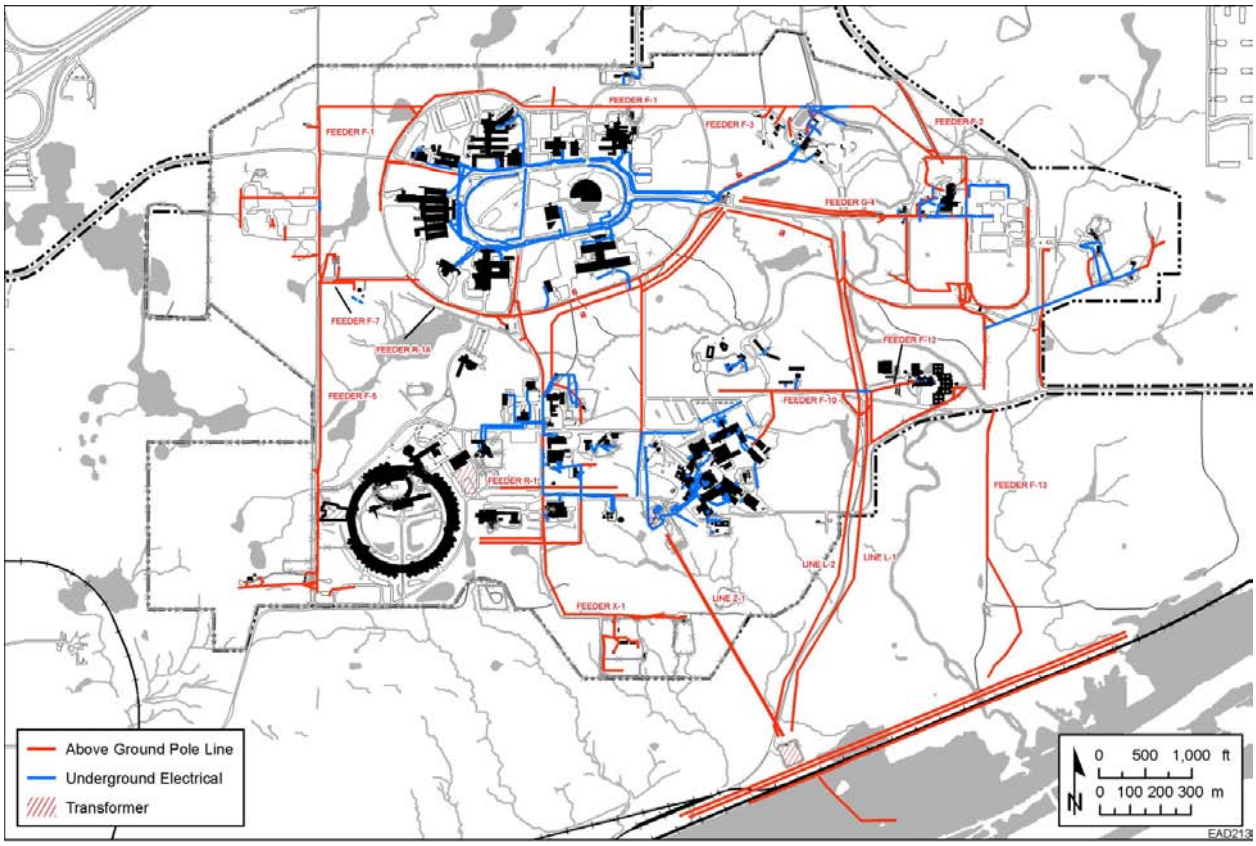

FIGURE D.24 Electric Power Distribution System

capacity, provide emergency power to the APS complex.

Distribution lines are generally 13.2 kV throughout the site. Voltage reduction transformers and switchgear are adjacent to or within each program facility. However, in the east area and the 800 area, the distribution lines are 4.16/2.4 kV, provided by substations (Facility 546 and Facility 548, respectively).

The primary Argonne electrical distribution system, which originates at Facility 543, was constructed as long ago as 1949. To maintain high levels of reliability and safety, major system rehabilitation has been necessary. Significant upgrades to the system since the early 1990s include replacement of transformers and associated equipment at Facilities 543, 544, and 545 and replacement of all polychlorinated biphenyl- (PCB-) filled exterior transformers. The underground distribution cable system and equipment in the 200 area were also replaced and upgraded. A supervisory control and data acquisition (SCADA) system was installed for remote control and monitoring of protective equipment at Facilities 543 and 544 in 1996. In FY 2001 a second 138-kV transmission line and associated equipment were installed.

Twenty-nine diesel-driven and one steam-driven emergency electrical generators are located on-site. The emergency generators are critical for protecting the environment, personnel, and vital data of long-term scientific experiments during potential electrical power outages. The single steam-driven emergency generator is located in Building 315.

The Argonne electric power distribution system has benefited greatly from several plant upgrades to increase reliability and replace aged equipment and switching systems, as well as to increase service capacity to the APS and 300 areas. Two original antiquated services remain. First, the 800 area distribution transformer

station and its service, now only connected to the Westgate Road guard post, the sole remaining facility in the 800 area, has been cleared for programmatic reuse and reassignment. Second, the antiquated street lighting system is of similar vintage. Approximately $171,000 remains in deferred maintenance (ACI = 0.99+; "excellent"), and the summary condition index is 0.04. Except for the two aforementioned obsolete systems, the measures are within a few tenths of a percent (ACI = 0.99+; summary condition index = 0.008) of the ideal. A significant service modification planned for portions of the 300 area will facilitate retirement and disposition of Building 301 at the end of the decade, after D&D of the hot cells is completed under DOE-EM funding, and will provide for additional service to accommodate load growth in the 200 area.

D.3.11 Telecommunications Systems

D.3.11.1 Telephone System

The PBX (private branch exchange) system that has served Argonne since 1987 is being replaced during the summer of 2005. The new PBX is an EADS Pointspan M6880 communications system of Internet protocol (IP) networked control servers operating on a dedicated local area network. The digital TDM (time division multiplexing) hybrid design has voice over IP (VOIP) enabled architecture. The hybrid design allows for transition from a digital TDM core to VOIP at locations where the infrastructure can support the service (currently planned for the new Center for Nanoscale Materials in 2006). Approximately 7,500 analog and digital telephones serve the three major organizations on the Argonne site: Argonne National Laboratory, the DOE Chicago Operations Office, and the New Brunswick Laboratory.

The PBX telephone system consists of north and south control nodes and seven distributed nodes connected to the main nodes by fiber optic cables (Figure D.25). Each node serves a building or group of buildings through a copper-wire-and-cable plant. In addition to switched PBX services, the wire-and-cable plant provides point-to-point copper and fiber circuits for on-site data communications, alarm systems, control systems, and audio systems. The wire-and-cable plant also provides for extending external private lines and miscellaneous services from the SBC interface to on-site user locations. A buried conduit system facilitates installation of new cables to all major buildings. The original cable plant was installed in 1987 and has a life expectancy of at least 30 years. A fiber optic cable plant that interconnects all major buildings for network, high-speed data, and video applications was installed in the conduit system in 1993, with a life expectancy of at least 20 years. Additional cable is installed incrementally as service requirements expand.

A DMS 100 switch in the SBC central office, 0.75 mile west of the site, provides direct incoming and outgoing commercial dial service. An FTS/MCI DS3 circuit provides direct-access long distance service and high-speed data communications.

Argonne added a NEXTEL transmitter to the top of the water tower (Facility 585, near Building 333) in the summer of 2004, and NEXTEL units are replacing most of the Laboratory's two-way radios. A multicarrier tower owned by U.S. Cellular is being constructed outside the security fence on out-leased property near the east area, near the intersection of Cass Avenue and Bluff Road, later this year.

D.3.11.2 Radio and Pager Systems

The Illinois State Police installed a 195-ft antenna tower at Building 364 in 1993. This tower is now the property of the federal government. It supports Argonne's antennas, as well as other state and local antennas.

Six radio networks provide operational and emergency communications for security, fire, safety, transportation, maintenance, and repair personnel. Thirteen base stations, more than 95 mobile units, and more than 410 portable units are assigned for these purposes. A radio paging system provides one-way paging to more than 1,000 pocket pagers. Seven additional low-power, short-range portable radio networks are operated within scientific programs. The Laboratory has contracted for commercial paging service for off-shift contact with key management and emergency service personnel throughout the Chicago metropolitan area.

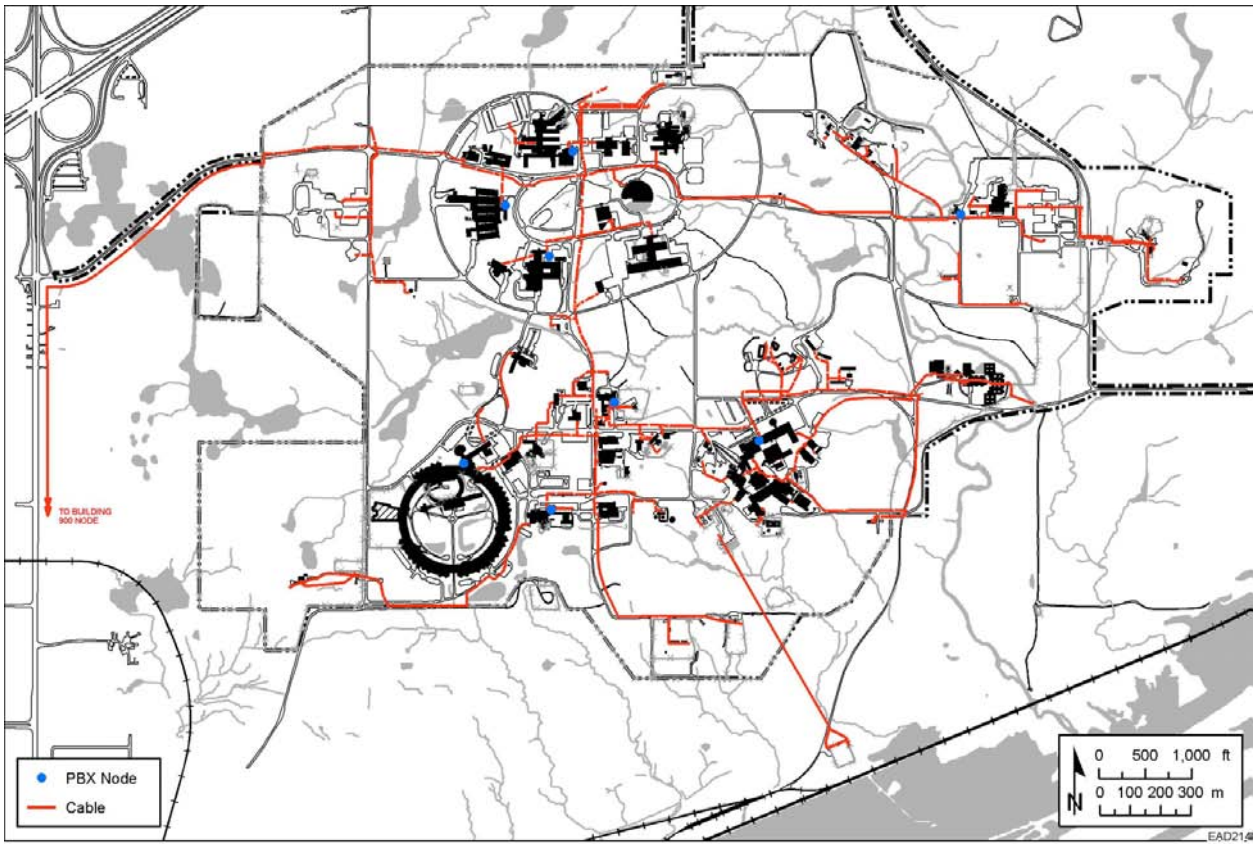

FIGURE D.25 PBX Communications

D.3.11.3 Sitewide Emergency Public Address System

The sitewide emergency public address system links all the areas on the site through voice communication. It is used primarily to alert on-site personnel to emergency situations. The system can also be used to communicate selectively with occupants of a specific area or individual building(s) on the site.

The sitewide public address system has been upgraded to include capabilities to monitor the integrity and detect failures of the system that could jeopardize personnel safety. The system is tested monthly, and observed localized interruptions are reported at that time.

Because of the age of the system and many of the buildings it serves, significant upgrades are planned over the next several years to increase coverage and reliability.

Estimates for replacement of the sitewide radio system are approximately $350,000, scheduled for FY 2006. A new head-end system required for the public address system control and associated upgrades for the buildings are estimated at $200,000, also scheduled for FY 2006.

TABLE D.1 Facility Conditions by Area[a]

Area	Area (1000 GSF)	OCC	RPV ($1000)	TRIC ($1000)	SCI	DM ($1000)	ACI	ACI Rating
East	59.418	70	13,215.5	1,645.0	0.124	95.9	0.993	Excellent
100	82.864	38	48,296.8	11,272.8	0.233	5,934.8	0.877	Fair
200	2,129.545	4,771	472,464.4	145,608.8	0.308	24,985.6	0.947	Adequate
300	488.951	382	148,669.1	37,878.1	0.255	3,528.0	0.976	Good
360	712.343	613	177,987.7	25,182.5	0.141	4,444.2	0.975	Good
400	1,127.358	691	296,947.9	8,340.3	0.028	104.8	1.000	Excellent
500	19.216	0	16,723.7	760.5	0.045	286.7	0.983	Excellent
600	48.039	0	6,126.5	5,375.6	0.877	1,357.8	0.778	Fair
800	0.050	0	85.3	34.5	0.404	1.6	0.981	Excellent
900 (Argonne Park)	16.624	85	2,629.2	440.2	0.167	28.7	0.989	Excellent
TOTALS	4,684.408	6,650	1,183,146.1	236,538.3	0.200	40,768.1	0.966	Good

[a] Abbreviations: GSF, gross square feet; OCC, building occupants; RPV, replacement plant value; TRIC, total replacement and improvement cost; SCI, summary condition index; DM, deferred maintenance; ACI, asset condition index.

TABLE D.2 Condition of Infrastructure and Utility Systems[a]

System	Area (1000 GSF)	RPV ($1000)	TRIC ($1000)	SCI	DM ($1000)	ACI	ACI Rating
Civil Infrastructure		15,906.1	5,877.0	0.369	4,261.4	0.732	Poor
Telecommunications		25,524.3	2,745.6	0.108	47.9	0.998	Excellent
Electric Power Distribution	1.025	47,599.6	1,705.1	0.036	171.2	0.996	Excellent
Natural Gas Distribution		1,451.5	0.0	0.000	0.0	1.000	Excellent
Sitewide Safety	0.080	1,571.5	7.7	0.003	0.9	0.999	Excellent
Security	0.150	1,364.5	45.6	0.033	9.9	0.993	Excellent
Collection and Treatment of Laboratory Wastewater	14.935	17,899.0	1,632.2	0.091	76.5	0.996	Excellent
Collection and Treatment of Sanitary Wastewater	4.431	17,432.9	1,404.4	0.081	256.0	0.985	Excellent
Storm Sewers		3,328.5	102.0	0.031	61.0	0.982	Excellent
Steam Generation and Distribution	66.495	55,709.8	13,215.2	0.237	8,443.1	0.848	Fair
Canal Water Treatment and Distribution	7.908	6,003.8	1,886.0	0.314	548.6	0.909	Adequate
Generation and Distribution of Chilled Water	9.005	20,533.3	170.4	0.008	19.3	0.999	Excellent
Domestic Water Treatment and Distribution	10.144	22,190.3	1,738.6	0.078	1,009.3	0.955	Good
Laboratory Water Distribution		1,941.2	350.0	0.180	231.5	0.881	Fair
TOTALS	114.173	238,456.2	30,879.9	0.129	15,136.4	0.937	Adequate

[a] Abbreviations: GSF, gross square feet; OCC, building occupants; RPV, replacement plant value; TRIC, total replacement and improvement cost; SCI, summary condition index; DM, deferred maintenance; ACI, asset condition index.

Appendix E: Performance Measures

E.1 Performance-Based Management

The U.S. Department of Energy has adopted performance-based management as the primary management approach for its own organization and for contractors. The DOE order Contractor Performance-Based Business Management Process (DOE O 224.1) includes the following requirements for contractors:

- Out of a partnering relationship, work with the cognizant DOE Field Element and document in a formal agreement and/or contract the establishment and use of agreed-to performance-based business management objectives, measures, and expectations by which overall performance will be evaluated.
- Have management systems for meeting performance objectives, measures, and expectations.
- Provide DOE with an annual written self-assessment.

The University of Chicago and DOE have incorporated the performance-based management approach into the contract (W-31-109-ENG-38) (hereinafter called the *Prime Contract*) for Argonne's management.

The Office of the Chief Operations Officer collects, tracks, and coordinates reporting of all operations performance measurements identified in Appendix B of the *Prime Contract*. This information is assembled monthly from the operations functional areas. The results are compiled for internal use as a management tool. They also become the basis for the midyear status review with DOE and are a major component of the annual self-assessment requirement.

The performance measurement system has established goals for science and technology, as well as operations. The stated goal for operations is as follows:

> *ANL will conduct all work and operate facilities cost effectively and with distinction, integrated with and supportive of its missions in science, technology, energy, and environment, while being fully protective of its workers, its users, the public, and the environment.*

Each performance measure is established with a set of objectives, measures, and expectations against which performance is assessed for each area identified. Performance-based contract measures that include both performance measures and system assessment measures are constructed to drive improvements. These measures focus on the effectiveness of systems and on maintaining the appropriate level of internal controls. They incorporate best practices and reflect the judgment of DOE and Argonne management as to key performance elements that will help to accomplish DOE's mission objectives. Mission-critical performance measures are tied directly to the performance fee. The performance measures are renegotiated each year, but infrastructure-related measures have been included every year since the system's inception.

E.2 Infrastructure Performance Measures for FY 2005

The FY 2005 performance contract measures include project management and facilities management in the infrastructure performance measure (10% of mission critical measures). Facilities management is weighted at 50% of the total performance. The objective of the facilities management measures is as follows: "As the M&O contractor for ANL, the University of Chicago is required to manage the stewardship of facility assets in a cost-effective manner that ensures their safe and reliable operation that is consistent with program missions." The measures developed to evaluate the FY 2005 performance in this area are as follows:

- *Measure 1: Maintenance Investment Index (MII).* This performance indicator is intended to monitor the contractor's efforts in meeting MII fiscal year goals set by DOE-SC.

- Description of Method: The MII, expressed as a percentage, is defined as actual maintenance expenditures divided by the replacement plant value (RPV) for conventional facilities at the site.

- Weight: 25%

• *Measure 2: Asset Condition Index (ACI).* The ACI is DOE's corporate performance objective and criterion for measuring facility condition. The ACI reflects the outcomes of real property maintenance and recapitalization policy, planning, and resource decisions.

- Description of Method: The ACI is the quantity 1 – FCI (facility condition index), where FCI is the ratio of deferred maintenance to replacement plant value. The FCI is derived from data in FIMS (ACI = 1 – FCI or 1 – [DM/RPV]).

- Weight: 15%

• *Measure 3: Energy and Greenhouse Gas Emission (GHGE) reduction compliance.* This performance indicator is intended to encourage compliance with the conservation goals set forth by Executive Orders and DOE Orders.

- Description of Method: Percent of Energy and GHGE Reduction – ([PY – CY]/PY) × 100, where PY = prior year energy use per gross square foot of floor area and CY = current year energy use per square foot of floor area, as reported in DOE's Energy Management System-4 (EMS-4).

- Weight: 10%

E.3 Other Performance Measures for FY 2005

The integrated safety management (ISM) performance measure related to land management and habitat restoration is measured as approximately 6% of the total ISM performance for FY 2005, as follows.

• Measure: Complete land management and habitat restoration work plan activities.

• Criterion: Complete work plan activities by the end of the fiscal year.

The Laboratory also has other energy management performance agreements with DOE for FY 2005.

E.4 Infrastructure Performance Measures for FY 2006

At this time, pending joint deliberations and negotiations among Laboratory management, DOE, and the University of Chicago, Argonne cannot identify the exact performance measures that will be in place for FY 2006 or their proportionate weights. Past practice indicates that the general weighting of the infrastructure-related categories will not change materially, though the detailed measures of performance are subject to slightly greater adjustment from year to year as emerging management issues and actual performance through the evaluation period become evident.

E.5 Self-Assessment

In addition to the development of specific contract performance measures tied directly to incentives, the performance-based management system includes an internal self-assessment program that fosters assessment of existing internal systems, policies, and procedures and encourages continuous improvement. The self-assessment program includes for the following:

• An assessment of performance against established objectives, measures, and expectations

• An assessment of overall operations

• Identification of opportunities and plans for improvement

E.6 Reporting

Quantitative performance measure data are collected monthly by the Chief Operations Officer. Quarterly performance briefings keep Laboratory management informed about infrastructure issues related to the performance measures.

Midyear and year end self-assessments (1) evaluate performance against the performance measures and progress on opportunities for improvement and (2) identify issues related to year end performance.

Appendix F:
Facilities Supporting Mission Activities

Mission-critical facilities at Argonne-East were identified on the basis of their functional performance in the current operating year. As Section 4.1 indicates, Argonne's approach for determining the mission relationship of a facility (i.e., whether the facility is *mission critical*, *mission dependent, not critical*, or *not mission dependent*) relies on a functional classification system that categorizes real property assets on the basis of occupancy (for a building) or design function (for an asset with a supporting or infrastructure function).

Facilities used directly by programmatic divisions for scientific research in support of DOE-SC missions and core capabilities are identified in Table F.1 and Table F.4 by Associate Laboratory Director (ALD). The frequency of multiple entries in the ALD columns indicates the level of programmatic interaction and multi-programmatic function in major Argonne research facilities.

Argonne facilities supporting mission activities are described in detail in Tables F.1–F.15.

TABLE F.1 Detailed Classification of Argonne Facilities — Direct Programmatic Mission

		Classification by Programmatic ALD[a]			
		P	A	S	FIS
Buildings — Mission Critical					
200	Chemistry	C	C		501
201	DOE-CH, ANL Administration & U.C.	D			501
202	Biosciences Division		C		501
203	Physics & Environmental Research	C	C		501
205	Chemical Technology Building	C	C		501
206	Engineering Development Laboratory		C		501
208	Engineering Research, Technology Development	C	C		501
211	Low Energy Accelerator Facility	C	D		501
212	Energy Technology Materials Science	C	C		501
221	Mathematics & Computer Science	C			501
223	Materials Science & Technology	C			501
308	Energy Technology Division		C		501
309	Energy Technology Division		C		501
310	Inspector General, PFS - WMO, Reactor Eng.		C		501
315	Technology Development/Reactor Eng.		C		501
316	Technology Development/ PFS Maintenance		C		501
331A	Energy Technology Division		D		501
360	IPNS Division Office, Technology Develop	C	N	C	501
361	IPNS Linac Injector Building			C	501
362	ES, HEP, TD, and Auditorium	C	C	C	501
364	Center Building		D	C	501
365	Ring Building/NPB Test Stand	C		C	501
366	Fabrication Area	C		C	501
367	IPNS Accelerator Facility Storage			C	501
369	APS, Energy Systems		C	C	501
370	TD Alex Facility/ES Facility	C	C		501
371	Transportation Test Facility		C		501
373	ES Equipment Storage		D		501
375	IPNS Experimental Area & Neutron Generator			C	501
376	Transportation Technology Engine Research		C	D	501
378	APS Storage			C	501
382	APS Vacuum Systems			C	501
385	IPNS Survey Calibration Area			C	501
389B	IPNS RF Power Supply Building			C	501
390	IPNS Cryogenic System & Laboratory			C	501
391	IPNS Rapid Cycling Synchrotron			C	501
399	IPNS NGS Control and Computer Area			C	501
400	APS Experiment Hall and Storage Ring			C	501
401	Central Lab and Office Bldg & Control Rm			C	501
402	APS Conference Center			C	501
411	APS Linear Accelerator Tunnel			C	501
412	APS Injection Wing			C	501
413	APS Low Energy Undulator Test Line Bldg.			C	501
415	APS Booster Synchrotron Tunnel			C	501
420	APS RF Extraction Wing			C	501
431	Lab/Office Module			C	501
432	Lab/Office Module			C	501
433	Lab/Office Module			C	501
434	Lab/Office Module			C	501
435	Lab/Office Module			C	501

TABLE F.1 Detailed Classification of Argonne Facilities — Direct Programmatic Mission (Cont.)

		Classification by Programmatic ALD[a]			
		P	A	S	FIS
Buildings — Mission Critical (Cont.)					
436	Lab/Office Module			C	501
438	Lab/Office Module			C	501
450	APS Utility Building			C	501
484	Meteorological Facility		C		501
Buildings — Mission Dependent, Not Critical					
214	PFS - FEC, SPPM, Safety & TD		D		501
335	Energy Technology Division		D		501
484A	Meteorological Storage Building		D		501
485	Greenhouse		D		501
Other Structures and Facilities 3000 (All) — Not Classified[b]					
063	Accel Linac 501 meV (In 361)				680
064	Accel Rcs ANL 500 meV (In 391)				680
065	Neutron Source (In 375)				680
066	Accel LI ANL (In 203-M)				680
067	Accel VG 12 meV (In 203-M)				680
068	Accel DY RA 4 mV (In 203-P)				680
069	Accel VG HV 2 mV (In 203-P)				680
070	Accel L1 AR21 mV (In 211-D)				680
072	Accel VG HV K5 (In 211-E)				680
079	APS Storage Ring (In 400)				680
080	APS Beam Lines & Front End (In 400)				680
081	Low Energy Undulator Test Line (In 413)				680
082	APS Synchroton (In 415)				680
083	Low Energy Transport Line (In 412-415)				680
084	High Energy Transport Line (In 415-400)				680
085	Positron Accumulator Ring (In 412)				680
Trailers — Mission Critical					
325CTR01	Trailer, HEP Astronomical Observations	C			
369-TR01	Trailer, Office		C		
399-TR03	IPNS Experimental Area Office			C	
399-TR04	IPNS Experimental Area Offices			C	
Trailers — Mission Dependent, Not Critical					
370-TR02	Trailer, Inside Building 370		D		

[a] Classifications: C, mission critical; D, mission dependent, not critical; N, not mission dependent. Programmatic Associate Laboratory Directors: P, Physical, Biological, and Computing Sciences; A, Applied Science and Technology and National Security; S, Scientific User Facilities.

[b] All Other Structures and Facilities 3000 category assets are managed by programmatic personnel and are considered to be mission critical without regard to their organizational affiliation.

TABLE F.2 Detailed Classification of Argonne Facilities — Indirect Mission Support

		FIS
Operations-Occupied Facilities — Mission Critical		
046	Site Services	501
314	Homeland Security, Radiological Assistance Program	501
333	Emergency Services Department	501
368	Power Distribution Building, PFS Crafts	501
Operations-Occupied Facilities — Mission Dependent, Not Critical		
046A	Site Services Cold Storage	501
107	Storage Building	501
114	Utility Systems Office & Shop	501
123	PFS Locker/Shower Room Facility	501
130	Storage Building	501
145	Storage Building and Shop	501
146	Utilities Office Building	501
213	Cafeteria	501
222	ECT & TSD	501
224	Argonne Information Center	501
302	Security	501
311	Experimental Building	501
313	Technology Development Storage	501
320	USDA Wildlife Services Field Facility	501
340	Post Office	501
363	Central Shops	501
372	ECT Offices	501
379	Central Lead Storage Facility	501
384	Storage	501
951	Argonne Recreation Center	501
952	Child Care Center	501

TABLE F.3 Detailed Classification of Argonne Facilities — Non-SC Programmatic Mission

		FIS
Non-SC Programmatic Mission — Mission Critical		
350	New Brunswick Laboratory	501

TABLE F.4 Detailed Classification of Argonne Facilities — Mission Support Facilities

		Classification by Programmatic ALD[a]			
		P	A	S	FIS
Waste Processing					
Mission Critical					
303	Mixed Waste Storage Facility				501
306	Waste Management Operations				501
317A	317 Area Groundwater Extraction Pump Station				
331	Shell Radioactive Waste Storage Facility				501
Mission Dependent, Not Critical					
306-TR01	Hazardous Waste Container				
306-TR02	Hazardous Waste Container				
306-TR03	Hazardous Waste Container				
306-TR04	Hazardous Waste Container				
306-TR05	Trailer Assay Facility				
318A	Waste Management Operations Storage				550
318B	Waste Management Operations Storage				550
Not Mission Dependent					
306A	Waste Management Operations				501
306B	EBR-II Storage				501
306C	Flammable Materials Shack				501
374A	Lead Mixed Waste Storage Building				501
Housing					
Mission Critical					
614	Lodging Facility	C			501
615	Lodging Facility	C			501
617	Lodging Facility/Exchange Club	C			501
618	Lodging Facility	C			501
619	Lodging Facility	C			501
620	Lodging Facility	C			501
621	Lodging Facility	C			501
Mission Dependent, Not Critical					
460	Argonne Guest House			D	501
600	Lodging Facility				501
Amenities — Not Mission Dependent					
300	Mobil Service Station				550
603	Swimming Pool				550
604	Bath House				501
606	Pavilion (Summer House)				550
616	Tennis Court				
950	Argonne Park Restrooms				550
953	Argonne Park Pavilion				501
954	Argonne Park Playground				550

[a] Classifications: C, mission critical; D, mission dependent, not critical; N, not mission dependent. Programmatic Associate Laboratory Directors: P, Physical, Biological, and Computing Sciences; A, Applied Science and Technology and National Security; S, Scientific User Facilities.

TABLE F.5 Detailed Classification of Argonne Facilities — Water Production, Distribution, and Storage

		FIS
Miscellaneous Facilities — Mission Dependent, Not Critical		
519	Water Sample Station-Sawmill Creek	
667	Water Wells Data & Observation	650
319A	319 Area Groundwater Extraction Pump Station	
Canal Water System		
Mission Critical		
581	Canal Cooling Inlet Structure	650
582	Canal Pumping Station	650
584	Canal Water Tank (500,000 gal)	650
585	Canal Water Tank (Elevated 250,000 gal)	650
Mission Critical, Graded Distribution		
583	Canal Treatment (Cooling Water)	650
Chilled Water System — Mission Critical		
528	Central Water Chilling System	650
Potable Water System		
Mission Critical		
031	#1 Well House (Shallow Well)	650
032	#2 Well House (Shallow Well)	650
127	Lake Michigan Flow Control Station	650
128	Ion Exchange Domestic Water	650
129	Pumping Station, Office	650
160	#5 Well House (Deep Well)	650
163	#3 Well House (Shallow Well)	650
264	#4 Well House (Shallow Well)	650
564	Domestic Water Tank (Elev. 300,000 gal)	650
565	Domestic Water Tank (Elev. 500,000 gal)	650
568	Fire Water Tank (650,000 gal)	650
569	Lake Michigan Water Metering Station	
Mission Critical, Graded Distribution		
520	Domestic Water Distribution System	650
671	Domestic Water Service to Buildings	650
Mission Dependent, Not Critical		
042	Elevated Water Storage Tank (150,000 gal)	650
Not Mission Dependent		
567	Lake Michigan Pump Station	650
607	Pool Filter & Pump House	650
Laboratory Water System		
Mission Critical		
566	Laboratory Water Tank (Elev. 75,000 gal)	650
Mission Critical, Graded Distribution		
521	Lab Water Distribution System	650
672	Lab Water Service to Buildings	650

TABLE F.6 Detailed Classification of Argonne Facilities — Sewer Collection and Treatment Facilities

		FIS
Sanitary Sewer System		
Mission Critical		
030	Sanitary Lift East Area	640
570	Sewage Treatment Plant	640
571	Sewage System Filter Beds	640
572	Sanitary Laboratory Composite Sample	640
574	Sanitary Treatment Laboratory, Sludge	640
576	WWTP Maintenance Building, Sludge Press	640
Mission Critical, Graded Distribution		
522	Sanitary Sewer System	640
673	Sanitary Sewer Service to Buildings	640
Not Mission Dependent		
573	Chlorinator Room (Abandoned)	640
679	Wash Water and Sludge Lagoon	640
Laboratory Sewer System		
Mission Critical		
592	Laboratory Wastewater Treatment Plant	640
595	Laboratory Wastewater Treatment Bldg	640
596	Lab Wastewater Treatment Blower House	640
597	Lab Wastewater Influent Pump Station	640
597A	Lab Wastewater Influent Valve Vault	
Mission Critical, Graded Distribution		
523	Laboratory Sewer System	640
674	Lab Sewer Service to Buildings	640
Mission Dependent, Not Critical		
593	Utility Service Storage	640
Storm Water — Mission Critical, Graded Distribution		
524	Storm Sewer System	640

TABLE F.7 Detailed Classification of Argonne Facilities — Civil Infrastructure

		FIS
Mission Dependent, Graded Distribution		
511	Roads	470
514	Walks	470
515	Parking	470
Not Mission Dependent		
502	Railroad System	635

TABLE F.8 Detailed Classification of Argonne Facilities — Communications

		FIS
Mission Critical		
541	Communications System	610
559	Public Address System	610

TABLE F.9 Detailed Classification of Argonne Facilities — Cooling Plant Facilities

		FIS
Mission Critical		
377	Cooling Tower Water Facility	550
377A	Cooling Tower Water Power	
377B	Cooling Tower Water Chemical Storage	
Mission Dependent, Not Critical		
377C	Cooling Tower Water Facility Storage	
377D	Cooling Tower Water Facility #2	

TABLE F.10 Detailed Classification of Argonne Facilities — Electrical Distribution

		FIS
Mission Critical		
206A	206 Substation C & D	
543	Transformer Station	615
544	Electric Switching Station	615
545	Outdoor Load Center-100 Area	615
549A	Outdoor Load Center-300 Area	615
549B	Transformer Station	
Mission Critical, Graded Distribution		
540	Electrical Distribution System	615
678	Electric Service to Buildings	615
Mission Dependent, Not Critical		
544A	Switchgear Building	
544B	Storage Building	
546	Outdoor Load Center-East Area	615
Mission Dependent, Graded Distribution		
542	Street and Security Lighting	615
Not Mission Dependent		
543A	Switchgear Building	
548	Outdoor Load Center-800 Area	615

TABLE F.11 Detailed Classification of Argonne Facilities — Natural Gas Distribution

		FIS
Mission Critical, Graded Distribution		
525	Gas Distribution System	625
526	Compressed Air System	625
676	Gas Service to Buildings	625

TABLE F.12 Detailed Classification of Argonne Facilities — Safety Systems

		FIS
Mission Critical		
351	Site Radio Repeater	620
489	Meteorology Tower	
558	Fire Alarm System	620

TABLE F.13 Detailed Classification of Argonne Facilities — Security Infrastructure

		FIS
Mission Dependent, Not Critical		
091	Guard Post-Eastwood Drive	480
291	Guard Post - Northgate Road	480
513	Perimeter Fencing	480
891	Guard Post - Westgate Road	480

TABLE F.14 Detailed Classification of Argonne Facilities — Steam Production, Distribution, Condensate

		FIS
Mission Critical		
108	Central Boiler House	645
108A	Scrubber - Recycle Building	
108B	Scrubber - Bag House	
115	Crusher House	550
116	Shaker House	550
125	Coal Yard Lift Station	
531A	Steam Reduction Station - East Area	
Mission Critical, Graded Distribution		
531	Steam Distribution System	645
677	Steam Service to Buildings	645
Mission Dependent, Not Critical		
108D	PFS Utility Storage	

TABLE F.15 Detailed Classification of Argonne Facilities — Surplus Facilities

		FIS
Mission Dependent, Not Critical		
040	INCAL Facility (Instrument Calibration)	501
Not Mission Dependent		
301	Hot Cell D&D Project	501
325C	Waste Storage Building	550
330	Former CP-5 Reactor	501

Appendix G: Real Property Management

G.1 Facilities Management

Argonne policy assigns facility management responsibilities into two parts: programmatic and nonprogrammatic. The purpose is to clearly separate the responsibility for maintenance of the general-purpose physical plant (nonprogrammatic) from the responsibility for the maintenance of the research machines and equipment (programmatic).

The Laboratory director has delegated responsibility for management of the nonprogrammatic general-purpose physical plant at Argonne to the Plant Facilities and Services Division (PFS). This responsibility includes management, maintenance, and repair of

- Building exteriors and internal general-purpose building systems (structural, mechanical, and electrical);
- Building offices and common areas, lobbies, washrooms, hallways, lunchrooms, auditoriums, and service areas;
- Fan lofts, service floors, and mechanical rooms, unless otherwise specified.

Environment, safety, and health (ES&H) aspects of the general-purpose physical plant are also the responsibility of PFS.

Programmatic support divisions and departments occupying space have responsibility for the management, maintenance, and repair of all specialized occupant-related equipment, experimental apparatus, and dedicated systems designed to support experimental or programmatic activities. All ES&H aspects of these operations are the responsibility of the occupant organization.

The cost of operating and maintaining each Argonne facility is assessed to the organizations occupying it as a building-specific cost per square foot of occupancy. This assessment includes the cost of common building maintenance, steam and water usage, and custodial services. In general, these costs are fairly constant from year to year. Budgets for these activities are established each year through the Laboratory's annual direct allocation budgeting process. To ensure their reasonableness, the costs of providing these services are tracked for historical consistency and benchmarked periodically against the costs of similar services at comparable institutions. The annual facility CAS and customer feedback help to ensure a proper magnitude for these activities.

G.2 Space Management

The purpose of the space management function is to ensure that the Laboratory plans, acquires, operates, and allocates facility space in accordance with the required government standards and best management practices.

To the extent possible, Argonne facility space is assigned to its most effective and efficient use consistent with current DOE program requirements. This is accomplished through integrated sitewide space management. The Argonne *Policy Manual* (6.6, Allocation of Space: Argonne) states in part:

> No division or department has exclusive jurisdiction over space utilization. Space is assigned by blocks of rooms, and within such assignment the division or department has jurisdiction. Use of space is monitored by the Director of PFS to assure compliance with this policy. Transfers of space between divisions or departments are prohibited. Space must be released to the Director of PFS for reassignment.

A space utilization charge (imposed to cover facility maintenance and operating costs) encourages divisions and departments to release unneeded space for reassignment. A Laboratory-wide view of all unmet space needs and all available space is maintained, so that space can be reassigned to ensure maximum use. New facilities are acquired only when needs cannot be met through reassignment of existing space.

Space management involves the following activities:

- Planning for new or reconfigured space
- Management of all space transfers on-site
- Development of space reports for budgeting and cost allocation
- Forecast analysis of required programmatic space and resulting vacant space
- Assistance to special Laboratory and DOE projects affecting real property assets

Space usage planning is performed for all new and remodeled spaces to ensure that appropriate GSA standards for space utilization are met.

The space management database is used to allocate each building's maintenance and operating costs (which vary by building) to the individual programs occupying the building. These costs (which principally include building and system maintenance and custodial services) are billed on the basis of building-specific cost per square foot of occupancy. To ensure the proper allocation of costs, the space management database is updated twice annually.

Each year a composite space forecast analysis projects sitewide space needs by program, to identify space that will become available for reassignment, and to identify new requirements for additional space. This information is also used to develop the vacant space budget allocation needed to support maintenance and operation costs associated with unoccupied space.

G.3 Space Charge System

The cost of space at Argonne is allocated to all site occupants on the basis of historical utility usage and square footage. The cost allocation is designed to recover actual costs associated with maintenance and operation of each facility, including operating costs for the steam plant and water plant and the cost of building maintenance mechanics.

At the beginning of the fiscal year, budgets are developed, reviewed, and approved for building maintenance and facility operations. These budgets cover salaries for building maintenance mechanics and utility maintenance mechanics; materials and supplies required by the mechanics; and resources for utility systems, such as water treatment chemicals, coal, and electricity.

After the budgets are approved, estimated resource consumption is calculated for each building. Every month the Plant Facilities and Services Division tracks resource consumption by recording meter readings for steam, water, and electricity. This historical information is used to estimate resource consumption for the new fiscal year.

For each consumable resource, a rate per unit is determined from the budget for the resource and the total number of estimated units. For example, dividing the estimated cost of operating the steam plant by the total estimated pounds of steam for the year develops a rate per pound of steam. The rates per unit are applied to the estimated resource consumption in each building. The costs for all consumable resources are summed to determine the total resource cost per building.

Each building consists of space that is rented or occupied; vacant space, which is rentable but not currently occupied; and institutional space, which is not rentable (such as hallways and restrooms). Some occupant, generally a cost center, is associated with every square foot of rented space. The building cost is divided by the rentable square footage of the building to determine a rate per square foot. This final rate per square foot is multiplied by the number of square feet occupied by each cost center to determine the cost to each building occupant.

Custodial costs are distributed to building occupants in a simpler though similar manner. The total custodial budget is divided by the number of custodians to develop a rate per custodian. The custodians are assigned to buildings on the basis of the needs of the building occupants. The number of custodians assigned to a particular building is multiplied by the rate per custodian to determine the custodial cost for that building. Once the cost is determined at the building level, it is distributed to the building occupants on the basis of the square footage occupied.

Beginning in FY 2004, Argonne increased space charges by a flat rate per square foot (the Maintenance Investment Index or MII) to recover

the cost of deferred maintenance. The costs portrayed in Figure G1 are average costs, capturing all facilities and all expenditures.

Argonne has worked to keep space charges as low as feasible over the last decades. Recent trends are indicative of that effort (Figure G.1). The average cost of space at Argonne, including the MII increment, has increased over the last five fiscal years at an annual rate of approximately 3.8%.

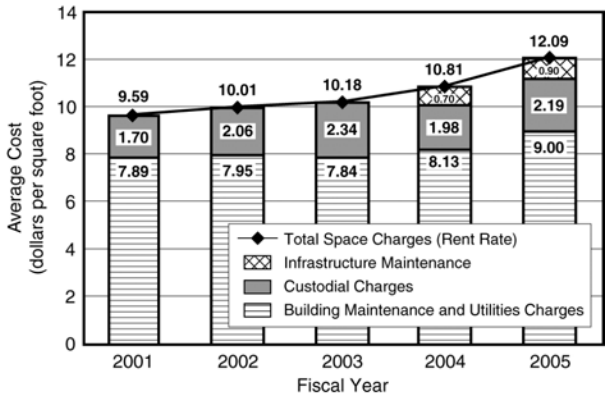

FIGURE G.1 Cost of Space at Argonne

G.4 Utilization

The Asset Utilization Index (AUI) is DOE's corporate performance measure regarding the use of facilities and land holdings. The AUI reflects the outcome from real property acquisition and disposal policy, planning, and resource decisions. Argonne is rated "good," at a utilization factor of 97.4%. The goal is a ratio of 1:1 for utilization-justified assets to current real property assets (i.e., AUI = 1). The index is the ratio of the area of all utilization-justified space in operating facilities or land holdings (numerator) to all operational and excess facilities or land holdings without a disposition baseline and funding (denominator). Ratings are assigned to AUI range measures. The AUI decreases as the excess and underutilized facilities at a site increase; it increases as excess facilities are eliminated and when consolidation increases the utilization rate of remaining facilities. As implemented in FIMS, the index captures only assets classified as buildings, which includes the vast majority of Laboratory-occupied space, though not all.

Argonne has had a deficit of vacant available space for more than a decade, as measured by typical BOMA (Building Owners and Managers Association) indicators for office and commercial space, with sitewide vacancy rates of less than 2% overall and less than 1% for administrative (office) uses. The measure as applied to Argonne is inherently a reflection of the need for disposal of two surplus facilities (Building 301 and Building 330; see Sections 4.3.1 and 4.3.3), funding for which has been largely external to direct Argonne control. Disposal of these two facilities would change Argonne's Asset Utilization Index from 0.974 to 1.00.

G.5 Leasing

Argonne leases one significant nearby office facility, Building 900, approximately 1.5 miles from the site. This facility accommodates approximately 240 personnel and includes 73,229 gross square feet (ingrant) at an annual base lease cost of approximately $674,000. Planned construction of the Theory and Computing Science Center (TCS) in the northern part of the 200 area is anticipated to free appropriately consolidated space to facilitate return of the Building 900 personnel to the site when construction is complete.

Additional off-site occupancy is being evaluated for approximately 50,000 square feet in the planned Center for Advanced Technology Facility at the Tech Center site near the DuPage County Airport. If the project is undertaken, occupancy is expected in early FY 2007. The location will facilitate improved interaction and educational outreach between coordinated accelerator research at Argonne, the Advanced Computing Center, technology transfer (incubator) outreach, high-energy physics, and fuel cell research involving Argonne's Transportation Technology R&D Center and Northern Illinois University.

Four other minor leaseholds, totaling 22,348 gross square feet, support activities at scattered locations outside Illinois, the most significant being 14,735 gross square feet for the Washington, D.C., liaison office.

Leased space is summarized in Table G.1.

TABLE G.1 Argonne Leased Facilities

Property Name	Area[a]	OCC[b]	Use	Leasing Plan
Catellus Development (Building 900) (ingrant)	73,229	240	Office	Relocation[c]
G.S. Investments LLC (Nebraska)	4,200		Storage	Continuing
Berndt and Sylvia Kornm (Germany)	947		Housing	Continuing
Potomac Creek (Washington, D.C.)	14,735	41	Office	Continuing
GDA Real Estate (Colorado)	2,466	8	Office	Continuing

[a] Area in gross square feet.

[b] Occupants.

[c] Occupants to be relocated on-site after construction of the Theory and Computing Science Center.

G.6 Other Facilities

Argonne has demonstrated leadership in obtaining funding from the state of Illinois for capital improvements that advance the Laboratory's scientific and science support capabilities. The state recognizes that Argonne's position as the Nation's premier federal research facility in the Midwest has exceptional potential to attract cutting-edge technology development and the associated knowledge base to the R&D corridors around Chicago and thus to contribute to the vitality of the area's economy. As a federal research laboratory with continuing missions, Argonne seeks to expand the precedent set by state-sponsorship to include other federal agencies, third-party development, and additional innovative means for underwriting the construction of new research facilities with highly specialized missions.

Two facilities whose construction was state sponsored, the Argonne Guest House and the Center for Nanoscale Materials, are described briefly below. Other initiatives in various stages of development include the Theory and Computing Science Center being proposed for funding under state of Illinois bonding authority and a third state-funded research support facility, the Illinois Science Center, proposed as part of the initial development of the Rare Isotope Accelerator initiative being considered for DOE funding.

The *Argonne Guest House* (Building 450) was completed in 1997 through state of Illinois funding. The six-story, 136,000-square-foot Guest House includes a 210-seat restaurant on the main level that is open to Argonne employees and 157 guest rooms, including 2 two-bedroom premiere suites with parlors and 11 four-bedroom suites with parlors. All suites have kitchenettes.

The *Center for Nanoscale Materials*, Building 440, now under construction, is a two-story structure similar to the APS in construction materials. It will include clean rooms, laboratories for chemical and physical measurements, computational laboratories, offices, and conference rooms. The total estimated cost of the project, $72 million, is split equally between DOE and state funding. The conventional facility is estimated at $36 million, provided by the state of Illinois, Department of Commerce and Community Affairs. The balance of the funding supports a $36 million Major Item of Equipment project funded by DOE for the primary instruments and beamline construction. Facility construction began in FY 2004. Completion is projected in FY 2006.

The proposed *Theory and Computing Science Center* (now pending Critical Decision-1 approval from DOE) is envisioned to accommodate up to 550 occupants and provide a focal point for interdisciplinary research involving teraflops computer systems, large-scale computation and high-end visualization, theory, computing science, and experimental validation. The facility, to be located at Argonne's Cass Avenue entrance, is expected to occupy up to 247,000 gross square feet. It will incorporate offices and laboratories, areas for collaboration and advanced digital conferencing, supercomputer support, and ancillary facilities. DOE has accepted the mission need for this facility (Critical Decision-0) and is proceeding with the necessary approvals to begin implementation of a design-build, third-party-financed project.

The proposed *Illinois Science Center* would be the first building of the Rare Isotope Accelerator (RIA) complex master plan to be built, following a favorable mission determination. The building mission is to accommodate and serve outside RIA users and related educational programs. The atrium building will contain approximately

71,500 gross square feet, including offices, laboratories, conference rooms, classrooms, an auditorium, and associated ancillary support spaces. Construction of the building will be funded by a $15 million grant from the state of Illinois, covering hard construction costs out to five feet from the building boundary. Costs for site utilities, paving and landscaping, parking, and work within existing connected buildings will be funded from other sources. This project has proceeded through final design under state funding. Upon successful selection of Argonne as the site for RIA, an aggressive construction schedule will begin.

Two other capital improvements at Argonne that do not rely on DOE capital funding are the Argonne Credit Union (Building 233), and the Howard T. Ricketts Laboratory, now in detailed design. These facilities are distinct from the other facilities because they are or will be operated by other organizations on ground leases from the DOE. They receive their supporting utility services from Argonne, but they do not operate under Argonne's direct management or oversight.

The *Argonne Credit Union* (Building 233) was built adjacent to the cafeteria in 1988 on a 99-year ground lease. Under the provisions of the lease, the 9,167-square-foot, single-story building will revert to government ownership at the conclusion of the lease or when the Argonne Credit Union chooses to vacate the property. Its location adjacent to the cafeteria, at the center of the site and near the center of population, affords maximum convenience to the employees who use the facility for checking, savings, and other financial services available to Argonne and DOE employees.

The University of Chicago's *Howard T. Ricketts Laboratory* (now in final design) will serve as a regional biocontainment laboratory and will conduct microbiology research to combat emerging infectious diseases and reduce the threat from bioterrorism. This facility, successfully proposed to the National Institutes of Health by a consortium led by the University of Chicago, ,will greatly benefit from its location within the security envelope of Argonne, with proximity for interaction with other researchers and facilities at the Laboratory. This facility will be owned and operated by the University of Chicago, separately from the contract under which the University operates Argonne. Upon eventual closure of the activities or at the end of the 99-year lease, the facility will either revert to federal ownership or undergo disposal and site restoration.

G.7 Facility Information Management System

FIMS is DOE's nationwide computer-based real-property tracking system. FIMS data are updated annually (as directed by DOE) by using information provided by various Laboratory organizations and personnel (e.g., Accounting, Human Resources, PFS, and building managers).

At the end of each fiscal year, the FIMS facility management data and the facility accounting data reported in the Argonne Financial Information System are reconciled. This coordination ensures that all new property assets have been recorded properly within the accounting data and that all demolished assets have been removed from the data set. FIMS has been updated to include the FY 2004 data requirements; there are no outstanding issues.

Argonne calculates the replacement value for each building or facility annually by using the Engineering News Record Cost Index. An average acquisition year is used for each building, because the cost of the building changes over time as additional construction projects are completed. The average acquisition year for each building is determined by using an average-year escalation factor that is the percentage by which the building is depreciated, multiplied by the useful life of the building. This number of years is subtracted from the current year to determine the average acquisition year. The replacement value is based on the increase in building cost from the average acquisition year to the current year. The index provides an annual average cost of construction from 1915 through the current year. A cost escalation factor for each year is calculated by dividing the current year's annual average cost by the average annual cost for the average acquisition year. The replacement value for each building or facility is then equivalent to the product of the total acquisition cost for that building and the cost escalation factor.

Changes in overall FY 2004 replacement plant value (RPV) at Argonne were uniformly below 5%, generally in keeping with the background rate of inflation. The RPV for the entire site, including all assets, grew by 1.8%; building and utilities each grew by approximately 2.5%; reactors and accelerators (OSF 3000) grew by 3.4%. Preliminary estimates of the rate of change for FY 2005 indicate an overall growth of approximately 7-8%, driven by the construction cost escalations of the Engineering News Record, which provides the actuarial basis for escalations of historical costs. These data will be entered into FIMS at the close of the fiscal year, per DOE-SC guidance, concurrent with updates to maintenance- and deficiencies-related data derived from the annual CAS process.

Appendix H:
Integrated Facilities and Infrastructure Budget Data Sheet for FY 2005–FY 2016

TABLE H.1 Integrated Facilities and Infrastructures Budget Data Sheet for FY 2005 – FY 2016

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area (GSF)	Cost ($ thousands)											
			FY 05 Approp.	FY 06 Approp.	FY 07 Budget	FY 08 Budget	FY 09 Budget	FY 10 Budget	FY 11 Budget	FY 12 Budget	FY 13 Budget	FY 14 Budget	FY 15 Budget	FY 16 Budget
SITE NAME: Argonne National Laboratory														
PROGRAM														
1.0 Capital Line Item (Include project number & identify Funding Program)														
1.1 New Construction (facilities and additions)														
None														
1.2 All Other Projects (recap)														
Building Electrical Service Upgrade, Phase II	07CH-062				1,248.0	8,200.0	7,552.0							
Laboratory Space Upgrades										1,200.0	6,400.0	6,000.0	14,400.0	49,800.0
Roads/Parking/Lighting										1,200.0	5,000.0	6,700.0	10,500.0	12,000.0
Mechanical and Controls System Upgrade											10,500.0	14,000.0	14,000.0	7,000.0
Building Electric Service Upgrade											8,000.0	11,600.0	5,000.0	
Central Heating Plant Auxilliaries Upgrade												4,000.0	7,500.0	2,900.0
Fire Safety Improvements, Phase V												1,000.0	3,000.0	2,000.0
Electrical System Upgrade, Phase IV													4,300.0	14,500.0
Building 362 Asbestos Abatement													1,500.0	4,000.0
Subtotal Line Item Projects					1,248.0	8,200.0	7,552.0			2,400.0	29,900.0	43,300.0	60,200.0	92,200.0
2.0 General Plant Project (GPP) KC-03-01-01-0														
2.1 New Construction (facilities and additions)														
None														
2.2 All Other Projects (recap)														
Replace FD and ID Turbine Drives & Clutches for #1 Boiler			71.5											
Upgrade of Coal Handling System			485.0											
Central Chilled Water Upgrade, Bldg. 205			546.0											
Upgrade 13.2 kV Switchgear, Bldg. 391			265.0											
Fire Protection System Upgrades, Multiple Buildings			355.0											
Upgrade 13.2 kV Switchgear, Bldg. 212			457.0											
Upgrade Site Fire Alarm Reporting System			450.0											
400 Area Chilled Water System Expansion			350.0	1,053.0	3,097.0	2,500.0								
Water and Wastewater Facilities Remote Monitoring/Automation			370.5											
317 North Storage Vault Water Infiltration/Alarm Improvements (split funded)			73.5											
Replace Computers/Software for Boiler Controls				110.0										
Restroom Upgrade Program 200/306			35.0											
ADA Compliance - Building 202/205 Elevators			570.5	359.0										
Fire Safety Improvements Program				500.0	500.0	500.0	500.0	500.0	990.0					
Space Rehabilitation Program				500.0					600.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0
Elevator Rehabilitation Program									200.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0
Restroom Rehabilitation Program									200.0	1,000.0	1,000.0	1,000.0	1,000.0	1,000.0
Air Condition Room H117, 363				200.0										
Bldg. 212 Hot Dock Crane Replacement				328.0	172.0									
Bldg. 306 Upgrade Heating/Cooling/Ventilation System					650.0									

TABLE H.1 (Cont.)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area (GSF)	Cost ($ thousands)											
			FY 05 Approp.	FY 06 Approp.	FY 07 Budget	FY 08 Budget	FY 09 Budget	FY 10 Budget	FY 11 Budget	FY 12 Budget	FY 13 Budget	FY 14 Budget	FY 15 Budget	FY 16 Budget
Crane Fall-Arrest System Upgrade, Bldg. 375					110.0									
EQO Instrument Shop Consolidation					60.0									
Upgrade Canal Water Storage Tanks, 584 and 585					611.0	789.0								
Northgate Modification					150.0	350.0								
Upgrade 2400 V Electrical System Facility 377, Phase II					150.0	450.0								
Install Access Ladder/Platforms for LOM HVAC Units, APS						90.0								
Install Permanent Hoisting Devices, Bldg. 450 Chillers						90.0								
Build 205 Exhaust Ventilation Needs - (e) F-111 requires separate exhaust						160.0								
Replace Hood Exhaust Damper Controls, 205						421.0	779.0							
Replace METASYS System						150.0	850.0							
Bldg. 306, D033 System Improvements							120.0							
Fire System Main Drains							110.0							
Stoker Feeders							500.0							
Sewer Renovation Completion							600.0	1,900.0						
Install Transfer Switch - Building 201, 222							300.0							
Install Restroom Facilities, Construct a Tornado Shelter, 484							150.0							
Connect 202 ACOND W-3 to Central Chilled Water System							150.0							
Additional 1000 Ton Chiller, Bldg. 205							500.0	1,600.0						
Water Recycling							750.0							
Air Condition Building 366							191.0	259.0						
SCADA Phase III								750.0						
Pressure Filters to replace sand filter beds, 574								300.0						
Replace Bldg. 301 Electrical Distribution Equipment								191.0	720.0					
Canal Water Tie-in to Illinois American Water									450.0					
Electrical Service for Offices, Bldg. 203, Wings A, B, C, E & J.									300.0					
Install Additional Electrical Outlets in Offices, Bldg. 205									150.0					
Add Air Conditioning for Building 370									200.0					
Add Air Conditioning to Bldg. 376									200.0					
Exhaust Fans in 360-362 Connection									100.0					
Upgrade Freight/Utility Elevator in H-137, Bldg. 212									400.0					
Metering of Canal Water									100.0					
Building Storm Drains, Phase II									490.0					
Bldg. 203 B-Wing West Entrance, ADA Accessibility									100.0					
Install Second Story level, Bldg. 203 R130 Highbay									100.0					

TABLE H.1 (Cont.)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area (GSF)	Cost ($ thousands)											
			FY 05 Approp.	FY 06 Approp.	FY 07 Budget	FY 08 Budget	FY 09 Budget	FY 10 Budget	FY 11 Budget	FY 12 Budget	FY 13 Budget	FY 14 Budget	FY 15 Budget	FY 16 Budget
Upgrade Drain Lines from 2" to 4", BLDG 370									200.0					
Additional GPP Projects										2,500.0	2,500.0	2,500.0	2,500.0	2,500.0
Subtotal GPP Projects			**4,029.0**	**3,050.0**	**5,500.0**	**5,500.0**	**5,500.0**	**5,500.0**	**5,500.0**	**5,500.0**	**5,500.0**	**5,500.0**	**5,500.0**	**5,500.0**
3.0 Institutional General Plant Project (IGPP)														
Roof Replacement Program				1,600.0	1,600.0	1,600.0	1,600.0	1,600.0	1,600.0	1,600.0	1,600.0	1,600.0	1,600.0	1,600.0
Space Rehabilitation Program				400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0	400.0
Subtotal IGPP Projects				**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**
4.0 Operating/Expense for Excess Elimination and Other														
4.1 Excess Elimination (demolition, sale, lease, transfer) Show area eliminated in Gross Area column														
SLI Excess Facilities Program														
Excess Facilities Disposition	KG0601													
Building 40 Demolition		-4,896	370.0		565.0	315.0								
Bldg. 325 C Demolition		-700	187.0											
Bldg. 202 W-wing		-2200	510.0											
Bldg. 205 K-116 Remediation		n/a	185.0											
Bldg. 370 Alkali Metal Loop		n/a	120.0											
Bldg. 202 Room Q-183		n/a	50.0											
Bldg. 205 F-111 Excess/Contaminated Media and Equipment Clean-up		n/a		620.0	55.0					675.0				
Bldg. 200 Heavy Isotopes Hood/Equipment Demolition Project MA 202		n/a		150.0										
Bldg. 374 Demolition Project		-1517			150.0	124.0								
Bldg. 202 Wings X, Y, and Z Demolition Project		-5654				187.0								
Bldg. 330 Wings K and J Demolition Project		-2985				144.0	182.0							
Bldg. 205 Room A-141 Decontamination and Equipment Demolition Project		n/a					159.0							
CP-5 Demolition Project		-17100					429.0	770.0	770.0	990.0	241.0			
Site Berylilium Cleanup		n/a								210.0				
Bldg. 205 X125 Glovebox/Equipment Demolition		n/a								125.0				
Bldg. 203 Storage Hole Cleanup		n/a								50.0				
Cleanup of Bldg. 310 A-128 and A-114		n/a								550.0				
Bldg. 205 F-111 Vault Cleanup and Hood Demoltion		n/a								630.0	370.0			
Bldg. 310 Demolition Project		-17,500									1,700.0			
Demolition of the Uranium Cadmium Cell in 308 high bay		n/a									575.0			
AGHCF Celanup Equipment cell storage area		n/a									344.0	181.0		
Cleanup of 300 Area Bone Yards		n/a										800.0		
Demolition of Sodium Loops in Bldg.308		n/a										325.0		
Bldg. 315 Clean-up rooms/High Bay		n/a										500.0		

TABLE H.1 (Cont.)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area (GSF)	Cost ($ thousands)											
			FY 05 Approp.	FY 06 Approp.	FY 07 Budget	FY 08 Budget	FY 09 Budget	FY 10 Budget	FY 11 Budget	FY 12 Budget	FY 13 Budget	FY 14 Budget	FY 15 Budget	FY 16 Budget
Demolition of Bldg. 306A		-900										75.0		
Hot Shop lab Cleanup		n/a										300.0		
Bldg. 206/208 Radiological Area Cleanup		n/a										475.0		
Bldg. 315 Clean-up Cells		n/a										574.0	26.0	
Hot Shop lab Equipment Cleanup		n/a											500.0	
Building 306 Evaporator System Demolistion		n/a											500.0	
Building 306 Tank Farm Demolition		n/a											700.0	
Clean-up of building 205 H-Wing Cells		n/a											350.0	
Building 212 H-Wing and hot Shop Cleanup		n/a											500.0	
Bldg. 208 Loop System, Passivation system and Retention Tank Cleanup/Refurbishment		n/a											550.0	
Old Tank Demolitions (300 West Area)		n/a											104.0	1,196.0
Building 212 C & G wing Clean Up		n/a												450.0
Building 205 F-Wing Cleanup		n/a												400.0
Building 212 E-Wing Cleanup		n/a												500.0
Building 205 G & K Wing Cleanup		n/a												600.0
Other Excess Facility Cleanup Work		n/a												84.0
4.1 Subtotal		**-52,552**	**1,422.0**	**770.0**	**770.0**	**770.0**	**770.0**	**770.0**	**770.0**	**3,230.0**	**3,230.0**	**3,230.0**	**3,230.0**	**3,230.0**
4.2 All Other (List direct O&E maintenance under 5.1)														
4.2 Subtotal														
Subtotal Operating/Expense Projects														
TOTAL Capital & Operating Investment:			**5,451.0**	**3,820.0**	**7,518.0**	**14,470.0**	**13,822.0**	**6,270.0**	**6,270.0**	**11,130.0**	**38,630.0**	**52,030.0**	**68,930.0**	**$ 100,930.0**
TOTAL Overhead Investments (IGPP)				**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**	**2,000.0**
5.0 Maintenance & Repair														
5.1 Direct Funded (by HQ or Site Program)														
List direct O/E maintenance projects														
SLI-Health and Safety Improvement Program	**KG0801**													
OSHA - Rigging, Crane and Lift Hazards, Phase 2			138.0											
OSHA - Electrical Phase 2			181.0											
OSHA - Walking, Working Surfaces, Housekeeping, Phase 2			120.0											
OSHA - Remaining Ladders (Phase 2, Priority 1)			200.0											
OSHA - Means of Egress, Phase 2			28.0											
OSHA - Fire Extinguishers and Fire Safety			141.0											
Ladder Compliance Modifications Program (Phase II, Priority 2)			192.0											
Subtotal SLI-Health and Safety Improvement Program	**KG0801**		**1,000.0**											
Deferred Maintenance Reduction Program (DMR)														
Window/Door Replacement Program						600.0	600.0	600.0						

TABLE H.1 (Cont.)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area (GSF)	Cost ($ thousands)											
			FY 05 Approp.	FY 06 Approp.	FY 07 Budget	FY 08 Budget	FY 09 Budget	FY 10 Budget	FY 11 Budget	FY 12 Budget	FY 13 Budget	FY 14 Budget	FY 15 Budget	FY 16 Budget
Sitewide Steam and Chilled Water Coil Replacement Program				200.0	200.0	200.0	200.0	200.0						
Air Quality Restoration					200.0	200.0	200.0	200.0						
Elevator Rehabilitation Program				200.0	200.0	200.0	200.0	200.0						
Restroom Rehabilitation Program				200.0	200.0	200.0	200.0	200.0						
Space Rehabilitation Program						600.0	600.0	600.0						
Building Exterior Structure Repairs Program					600.0	500.0	1,200.0	500.0						
HVAC Repairs Program						1,000.0	2,527.0	6,830.0						
Interior Structure Repairs Program						500.0	600.0							
Plumbing Repairs Program						862.0	2,338.0	3,000.0						
Paving Program					1,045.0	1,045.0	1,045.0	1,045.0						
Repair R-6 Plate Heat Exchanger & Controls, Bldg. 203					100.0									
Building 212 G-Wing Hood Exhaust Rehab					100.0									
Replace Steam Deaerator Pumps (3) #1 and #4					90.0									
Replace Fence Lighting, East Area along Cass Ave.					45.0									
Bldg 203 Air Handling Units					150.0	350.0								
Replace HEPA Exhaust Fans, X-Wing 205					122.0	378.0								
Bldg. 212 F-Wing Fan Loft Structural Repairs					78.0									
Repair Building 308 Air Conditioning					100.0									
Exhaust Fan System & Hood Controls, Bldg. 200 A-wing					270.0									
Replace Library ACOND D-1, 203					80.0									
Replace Converters & Pumps, 362					70.0									
X-Wing HVAC Systems - 205					150.0									
HVAC Replacement, 214 South					200.0									
Replace 2 Linac AC Units and Air Handlers, 361					200.0									
Replace Chillers 619 and 620					300.0									
Replace Air Handlers 360, Install Metasys on Air Handlers						200.0								
Replace Drip Pans and Drainage System in Ring Area, 365						30.0								
Replace Vinyl Floor Tile in Labs A114 & A142, Bldg. 200						20.0								
Lodging Facility Renovation						100.0								
HVAC Mixing Boxes Rehab, Bldg. 212						215.0	500.0							
Repair wall panel leaks, APS & 201						100.0								
Replace Air Compressors, 203, 360 and 375						300.0								
Replace Dom/Lab Hot Water Heat Exchangers and Pumps, 200 A-Wing							150.0							
Replace Perimeter Heating System, Bldg. 200 A-Wing							100.0							
Replace Asbestos Floor Tile, Bldg. 200 A-Wing Offices and Corridors							200.0							
Ceiling System Replacement, Corridors and Labs, 200 A-Wing							100.0							
Chiller Replacement, 221							150.0							

TABLE H.1 (Cont.)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area (GSF)	Cost ($ thousands)											
			FY 05 Approp.	FY 06 Approp.	FY 07 Budget	FY 08 Budget	FY 09 Budget	FY 10 Budget	FY 11 Budget	FY 12 Budget	FY 13 Budget	FY 14 Budget	FY 15 Budget	FY 16 Budget
Building 222 Equipment Grounding							20.0							
Replace Overhead lamps, Bldg. 366							45.0							
Restrain Masonry Wall Top, Bldg. 205							25.0							
Replace All Emergency Exit Signage, Bldg. 212								51.0						
Paint Corridors, Bldg. 362								25.0						
Replace or paint ceiling tile, 362								15.0						
Bldg. 206 Replace D-Wing Air Conditioning								75.0						
Building 362 Rotunda and Auditorium Rehab								500.0						
Replace Dining Room Lighting, Building 213								121.0						
Repair exposed foundation, 223								20.0						
Replace Floor Tile 3rd. Floor, Bldg. 362								250.0						
Replace Siemens Switchgear meters at APS								25.0						
Argonne Park Rehabilitation								43.0						
Subtotal Deferred Maintenance Reduction Program (DMR)				**600.0**	**4,500.0**	**7,600.0**	**11,000.0**	**14,500.0**						
Total Direct Maintenance & Repair			**1,000.0**	**600.0**	**4,500.0**	**7,600.0**	**11,000.0**	**14,500.0**						
5.2 Indirect (from Overhead or Space Charges)														
Include indirect O/E maintenance projects in total			22,851.3	22,851.3	22,851.3	22,851.3	22,851.3	22,851.3	22,851.3	22,851.3	22,851.3	22,851.3	22,851.3	22,851.3
APS Electrical Utility Repairs			45.0											
Refurbish ID and FD Fans for Boilers 1-4			65.0											
Replace Roof Top AC Unit, 333			11.0											
Upgrade Lighting Levels, Bldgs. 363			40.0											
Reconfigure Natural gas metering runs: Boilers #1 - #5			45.1											
Repairs to 377 Cooling Tower B			190.0											
Repairs- 549 Transformers T5 and T6			8.5											
364 Conduit Replacement			30.0											
Bldg. 200 A-Wing Repairs			2.0											
Boiler #5 Repair Fire Box Front Wall			70.0											
Building 223 Dock Repairs			12.0											
SCADA Electrical Distribution			20.0											
203 G-Wing Masonry and Tuckpointing Repairs				63.3										
Bldg. 205 K-116 Floor Repairs and Painting			10.0											
Bldg 213 Cooling Tower Pipe Replacement			75.0											
Carpet Replacement, 201, Phase I			150.0											
Bldg. 362 Dock Gas Cylinder Storage			40.0											
Replace Walk-in Refrigeration Units, Bldg. 213			75.0											
Replace 13.2 kV Cables, Bldg. 212			53.0											
Building 202 Humidity Repairs			30.0											
Building 200/301 Steam and Condensate Repairs			112.0											
Replace Chiller R8, Bldg. 203			25.0	175.0										
Roof Stairwell Tuckpointing			50.0											
Replace Chiller R6, Bldg. 203 (split funded)				150.7										
Upgrade Secondary Chiller Water Pumping, Bldg. 364 (split funded)				36.2										

TABLE H.1 (Cont.)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area (GSF)	Cost ($ thousands)											
			FY 05 Approp.	FY 06 Approp.	FY 07 Budget	FY 08 Budget	FY 09 Budget	FY 10 Budget	FY 11 Budget	FY 12 Budget	FY 13 Budget	FY 14 Budget	FY 15 Budget	FY 16 Budget
Upgrade Lighting, Buildings 200 & 202 (split funded)				128.3										
Building 201 Damper			20.0											
High Bay Area Rehabilitation, Bldg. 362			75.0											
Reheat Coil Replacement, Building 221			55.0											
Building 371 Lighting			20.0											
Roof Repair Program			150.0	200.0	200.0	200.0	200.0	250.0	200.0	200.0	200.0	200.0	200.0	200.0
Sitewide Lightning System Program			25.0	100.0	100.0	100.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Sitewide Bldg. Electrical Grounding System			25.0	100.0	100.0	100.0	75.0							
Roof Replacement Program			500.0											
Window/Door Replacement Program			105.0	200.0	100.0				600.0	600.0	600.0	600.0	600.0	600.0
Site Chiller 10 Year Overhaul Program			140.0	200.0	200.0	300.0	300.0	300.0	460.0	300.0	300.0	300.0	300.0	300.0
Inadequate PA Systems Program			50.0	150.0	150.0	150.0	150.0	150.0	250.0	150.0	150.0	150.0	150.0	150.0
Overhead Crane Modifications Program			75.0	150.0	150.0	150.0	150.0	150.0	225.0	150.0	150.0	150.0	150.0	150.0
Storm Sewer Program				50.0	50.0	50.0	50.0	50.0	100.0	50.0	50.0	50.0	50.0	50.0
Restroom Rehabilitation Program			100.0											
Sitewide Steam and Chilled Water Coil Replacement Program			100.0						200.0	100.0	100.0	100.0	100.0	100.0
Sitewide Tuckpointing Program				50.0	50.0	50.0	50.0	50.0	100.0	50.0	50.0	50.0	50.0	50.0
Air Quality Restoration (MOVED TO DMGPP IN 2007-2010)				200.0					200.0	100.0	100.0	100.0	100.0	100.0
Erosion Control Program				25.0	25.0	25.0	25.0	25.0	50.0	25.0	25.0	25.0	25.0	25.0
Site Buildings; Foundation Repairs Program			25.0	50.0	50.0	50.0	50.0	50.0	75.0	50.0	50.0	50.0	50.0	50.0
Paving Program			200.0	1,045.0					1,045.0	1,045.0	1,045.0	1,045.0	1,045.0	1,045.0
APS 13 kV Insulators				20.0										
Ladder Compliance Modifications Program (Phase II, Priority IV)				854.0										
Ladder Compliance Modifications Program (Phase II, Priority V)					841.0									
Ladder Compliance Modifications Program (Phase II, Priority 3)						203.0								
Ladder Compliance Modifications Program (Phase II, Priority III)							205.0							
Travelling Grates				100.0										
Underground Storage Tank Upgrade				360.0										
APS 13kV Barrier Boards				60.0										
Upgrade Air Handling System & DDC Controls, 200 A-wing				32.5	967.5									
Repair Emergency Egress Exits A & D Wings, 203					50.0									
Emergency Eyewashes & Safety Showers - Phase 1					611.0									
Exterior Precast Wall Repair, 350					100.0									
Canal Water Line Rehab					550.0									
Outfall 001 Sewer Line Renovation - Phase II					205.5	144.5								
Modify Boiler Warm-Up, Boilers 1-5						125.0								
Hood Controls, 203 Wings B, C, E and J						200.0								

TABLE H.1 (Cont.)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area (GSF)	Cost ($ thousands)											
			FY 05 Approp.	FY 06 Approp.	FY 07 Budget	FY 08 Budget	FY 09 Budget	FY 10 Budget	FY 11 Budget	FY 12 Budget	FY 13 Budget	FY 14 Budget	FY 15 Budget	FY 16 Budget
Exhaust Fan Sys.& Controls, G-Wing, 205						500.0								
Replace L-Wing Cabinet Fan Coil Units, 205						50.0								
Replace Library Air Handler, 205						65.0								
Repairs to HVAC Air Handling Units, L-Wing Bldg. 205						500.0								
G-Wing HVAC in 1st Floor Labs, 212						75.0								
Install Electric Outlets in Bldg. 200 A-wing Offices						20.0								
Install Hand Rails, Bldg.200 Auditorium						20.0								
Air Condition Room 124, Bldg. 46						15.0								
HVAC Controls Rehab, 222						450.0								
Central Chilled Plant Controls Replacement, 371D						35.0								
Replace Woods Exhaust Fans(2); Bldg. 200 A - Wing						120.0								
Bldg. 211 VandeGraaff Area HVAC						100.0								
Repair underground condensate line to 211						100.0								
Overhaul 362 Air Compressor						15.0								
Replace computer room AC unit, H-Wing 362						100.0								
Bldg 206 Substations C and D Replacement						187.5	462.5							
Replace Sanitary Drain Main Line F-wing , 203						100.0								
Lighting and Cooling Rehab, 314 Highbay						200.0								
Replace Power Supply for Pump, 368							75.0							
Replace Air Supplies, Bldg. 200 M, and C Wings							250.0							
Improve HEPA Filter Enclosures - sitewide							250.0							
Parking Lot Lights and Underground Cables, 360/362 and 212							123.0							
Build 205 Exhaust Ventilation - (f) H-125 ductwork replacement							100.0							
Replace Fan Coil Units, Bldg. 205, R&W Wings							85.0							
Enclosure over Emergency Exit, Y-Wing, 205							30.0							
399 Trailer 3 HVAC Replacement							20.0							
Replace Fan Coil Units(2) in Lab A102, Bldg. 200							30.0							
Replace Motor Drives #5 Boiler ID and FD Fans							250.0							
Rehab Exterior Lighting for Building 370 and 376							50.0							
Replace Fan, ACOND 7-1, Bldg. 223							50.0							
Replace Outside Air Intake Screens, Multiple Buildings							125.0							
Replace PVC Drain Lines, 401							40.0							
Replace Programmable Starter on Electrical Equipment, APS							100.0							
Replace Induction Unit Piping, 362							100.0							
Replace Rooftop AC units, 363A							75.0							
Modify Chilled Water Piping and Upgrade HVAC Systems, 314							150.0	350.0						
Replace Chillers (2) in Bldg. 350							149.5	380.5						

TABLE H.1 (Cont.)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area (GSF)	Cost ($ thousands)											
			FY 05 Approp.	FY 06 Approp.	FY 07 Budget	FY 08 Budget	FY 09 Budget	FY 10 Budget	FY 11 Budget	FY 12 Budget	FY 13 Budget	FY 14 Budget	FY 15 Budget	FY 16 Budget
Replace Storm Sump Pump System, Bldg. 200 A-Wing							150.0							
VFD Replacement, 450							150.0							
Transformer Oil Treatment and Leak Repairs - sitewide							150.0							
Building 208 Cooling Tower Staircase							20.0							
Lab Hot Water Line Replacement, 212 E-Wing							75.0							
Add Solar Film to Bldg. 201 Office Windows							25.0							
Repair Lab Water Piping Insulation, 205							20.0							
Replace Joy Air Compressor - 368							115.0	85.0						
Replace Utility Shut Off Valves, 205								20.0						
Replace Service Floor Lighting, 205								40.0						
Exhaust Fan Failure Notification, 205								50.0						
331 level 4 floor repairs								100.0						
Plumbing Network Repairs/Replacement 333								55.0						
HVAC Rehab, Bldg. 208 G-Wing								100.0						
Heaters on outside wall stairwell and corridor, 205								25.0						
Service Floor Exhaust, C, X and L Wings, 205								25.0						
138Kv Circuit Breakers, 549A								30.0						
Repair Compressed Natural Gas Fueling Station, Phase 2, Bldg. 46								40.0						
Bldg. 208 HVAC repairs, F-Wing								75.0						
Replace 212 H-Wing Lighting								30.0						
Replace High Bay Ceiling Heaters, 308								40.0						
Raise Sunken Area of Building 308								20.0						
Replace 335 Air Conditioning								150.0						
Interior Wall/Cabinet Painting, Bldg.200 Labs, A174, A178 & A182								40.0						
Replace Lighting Fixtures in Offices, Labs & Corridors Bldg 200 A-wing								100.0						
Window and Masonry Repairs, Bldg. 203								100.0						
Replace Asbestos Floor Tile, Bldg. 203 Offices and Corridors								300.0						
Bldg. 208 Dock Repair								30.0						
Replace Lab Benches, 223								50.0						
Hard Surface Around Chiller, 309								15.0						
Carpet Replacement, 201, Phase II and beyond								250.0	249.5					
Bldg. 206 A-Cond-17 (B133) replacement								40.0						
Replace Emergency Lighting Fixtures in ATLAS								50.0						
Replace Sump Pit Controls, 203 and 208								40.0						
Rebuild or Replace Pumps 377C Tower								125.0						
Replace Isolation Valves in Central Chilled Water Plant								100.0						
Replace 2 fan coils in MB Wing, 200								25.0						
Install Heaters & Replace Dampers, Generator Rooms 400								30.0						

TABLE H.1 (Cont.)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area (GSF)	Cost ($ thousands)											
			FY 05 Approp.	FY 06 Approp.	FY 07 Budget	FY 08 Budget	FY 09 Budget	FY 10 Budget	FY 11 Budget	FY 12 Budget	FY 13 Budget	FY 14 Budget	FY 15 Budget	FY 16 Budget
Sound Attenuation for Mycom Chiller, Bldg.450								50.0						
Replace 16" Automatic Tower Valves, 362								150.0						
Bldg. 221 Substation Replacements								242.5	257.5					
Replace furnaces in 372								75.0						
Replace Air Compressors, 202, 223, 212								22.0						
CFC Conversion of Chillers (3)									240.0					
Replace Chillers (2) in Bldg. 201									123.0					
Child Development Center Repairs - Multiple years									100.0					
Additional Major Repairs - Management Reserve			30.0							1,655.0	1,655.0	1,655.0	1,655.0	1,655.0
Major Repair Projects Burden			622.1	981.0	981.0	981.0	981.0	981.0	981.0	981.0	981.0	981.0	981.0	981.0
Subotal Indirect Maintenance & Repair			**26,327.0**	**28,332.3**	**28,332.3**	**28,332.3**	**28,332.3**	**28,332.3**	**28,332.3**	**28,332.3**	**28,332.3**	**28,332.3**	**28,332.3**	**28,332.3**
6.0 Indirect O&E Excess Elimination (demolition, sale, lease, transfer) Show area eliminated in Gross Area column														
Operating Funded Demolition Program		0	200	200	200	200	200	200	200	200	200	200	200	200
Total Indirect Excess Elimination		**0**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**	**200**

Appendix I:
Value Engineering

Value engineering, in accordance with Office of Management and Budget Circular A131, Public Law 104-106, DOE O 413.2, American Society for Testing and Materials Practice 1699-00, and Argonne policy, is part of the review process for every project, regardless of the dollar value of the project. As practiced by the Facility Engineering and Construction (FEC) Department in the implementation of infrastructure maintenance, rehabilitation, and improvement projects, value engineering is a graded approach with respect to the constraints of cost, schedule, and quality to improve the life cycle cost of the completed work. The goal of the process is to improve project value by eliminating unnecessary costs.

The value engineering process includes build/buy analysis, design-build versus design-award analysis, standardization of components and processes, combination of like work, and optimization of competitive procurement practices. This process decreases life cycle costs associated with real property asset acquisition, repair, disposition, demolition, and recapitalization projects, while maintaining the necessary level of performance and safety. The formal value engineering analysis and documentation required for all line-item projects is generally performed by an outside firm specializing in value engineering.

Appendix J: Maintenance Program for Nuclear Facilities

Each nuclear facility at Argonne has developed a Maintenance Implementation Plan (MIP) that meets the requirements of DOE O 433.1, Maintenance Management Program for DOE Nuclear Facilities, by using a "graded" approach. The MIPs have been reviewed and approved by DOE. Each MIP describes the maintenance program implemented to fit the requirements of the respective nuclear facility.

Programmatic activities conducted within a facility might require the facility to be classified as a nuclear facility for the purpose of operational controls and ES&H matters. In these cases, specialized programmatic equipment, systems, and components are maintained by the occupant; PFS has responsibility for the general-purpose plant.

Nuclear facility managers are appointed by the division director responsible for each nuclear facility. The nuclear facility managers have authority over operational and maintenance activities within their facilities. PFS accomplishes its designated responsibilities in a subsidiary, support role. Facility support agreements developed between PFS and divisions that maintain nuclear facilities delineate the roles and responsibilities of each division. The facilities listed in Table J.1 fall under DOE O 433.1.

Coordination of maintenance activities is accomplished at the direction of the nuclear facility manager by facility staff in close coordination with supervisory personnel of the maintenance service providers. These arrangements are fully documented in executed Facility Support Agreements between the facility managers and the organizations providing support. Each supporting organization is responsible for familiarity with its own policies and procedures and for its own personnel. A work permit process documents appropriate approvals for specific work activities. Facility managers communicate expectations through periodic training.

The performance of nuclear facilities is reflected in the overall facilities performance indicators. Nuclear maintenance program performance is evaluated in periodic self-assessments conducted to measure the effectiveness and efficiency of the program.

TABLE J.1 Facilities Falling under DOE Order 433.1

Facility	Description	Hazard Category	Responsible Program
Building 205	G and K Wing Laboratories	3	Chemical Engineering Division
Building 212	Alpha-Gamma Hot Cell Facility	2	Energy Technology Division
Building 303	Mixed Waste Facility	3	Plant Facilities and Services Division
Building 306	Waste Management Operations Facility	3	Plant Facilities and Services Division
Building 331	Radioactive Waste Storage Facility	2	Plant Facilities and Services Division
Building 350	New Brunswick Laboratory Facility	2	New Brunswick Laboratory